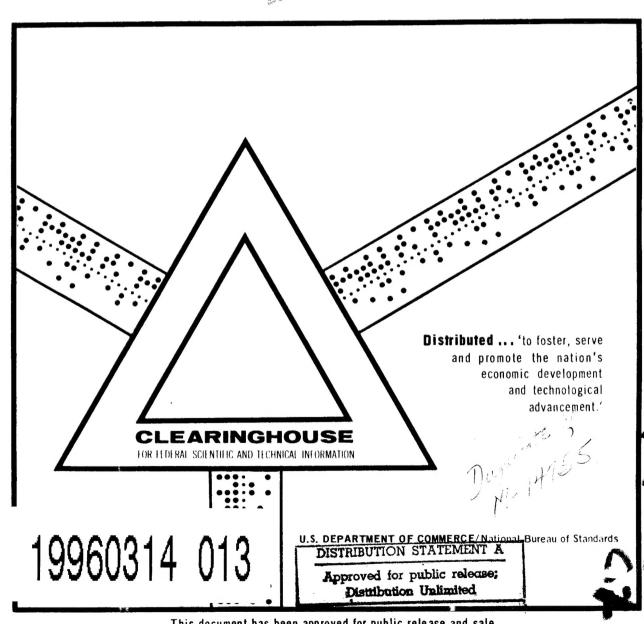
LABORATORY STUDIES OF TERMITE RESISTANCE V. THE TERMITE RESISTANCE OF PLASTICS

F. J. Gay, et al

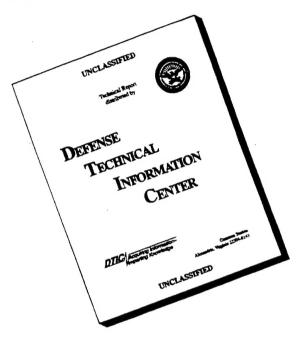
Commonwealth Scientific and Industrial Research Organization, Australia

1969





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V. The Termite Resistance of Plastics

F. J. GAY and A. H. WETHERLY

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DIVISION OF ENTOMOLOGY TECHNICAL PAPER NO. 10
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL
RESEARCH ORGANIZATION, AUSTRALIA 1969

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V. The Termite Resistance of Plastics

By F. J. Gay and A. H. Wetherly

Division of Entomology Technical Paper No. 10 (Superseding Technical Paper No. 5)

Commonwealth Scientific and Industrial Research Organization, Australia Melbourne 1969

FOREWORD

The first edition of this publication, which appeared in 1962, contained the first comprehensive account of laboratory tests to evaluate the termite resistance of plastics. It attracted considerable attention not only from manufacturers, suppliers, and consumers of plastic products in Australia but also from many overseas countries, and as a result it has been out of print for some time.

Since the first edition, laboratory studies of the termite resistance of plastics have continued, and again an appreciable volume of useful information, which could be of value to manufacturers and consumers of plastics, has been accumulated.

It was felt, therefore, that the most satisfactory and economical solution would be to bring together in a single publication all the laboratory studies on the termite resistance of plastics that have been carried out by this Division. In doing this, virtually all of the first edition has been incorporated in the present paper, with only minor amendments where necessary. This approach eliminates both the need for continual cross-references to the earlier paper and the problem of locating a copy when specific details are required.

LABORATORY STUDIES OF TERMITE RESISTANCE

V. THE TERMITE RESISTANCE OF PLASTICS

By F. J. GAY* and A. H. WETHERLY*

[Manuscript received March 14, 1969]

Summary

An account is given of a series of laboratory tests to determine (i) the resistance to termite attack of various plastics, (ii) the factors affecting such resistance, and (iii) methods of improving resistance of those plastics shown to be susceptible to attack.

The plastics in common use vary widely in susceptibility to attack and range from highly resistant materials such as nylon, phenolic laminates, and epoxy and polyester resins to readily damaged materials such as plasticized polyvinyl chloride, low-density polyethylene, and cellulose esters.

The nature of the surface finish is unimportant in relation to termite attack. An increase in thickness of plastic films or foils has been shown to reduce the susceptibility to attack but the reason is not evident. In some materials hardness appears to be important. This has been observed in studies with materials such as polyvinyl chloride or cellulose acetate with different amounts of plasticizer, and also in polyethylenes of different density. Polyethylene also shows increasing termite resistance as molecular weight increases and melt flow index decreases.

There are indications that susceptibility is also influenced by the choice of plasticizer as polyvinyl chloride plasticized with tricresyl phosphate is significantly less susceptible than when plasticized with dioctyl phthalate.

The amount of attack on susceptible plastics may be reduced by the addition of small quantities of any of several insecticides, of which the best appear to be aldrin and dieldrin. Possible hazards involved in the widespread use of plastics with such additions require further investigation. A significant reduction in damage to susceptible plastics materials has been achieved by the addition of a small volume of a non-toxic mineral filler such as hard silica or zircon flour, but practical application is limited by processing difficulties.

The relevance of results of laboratory tests of plastics to their performance in service, and the applicability of these results in Australia, are discussed.

I. INTRODUCTION

The increasing use of plastics for a wide variety of purposes has meant that in certain applications these materials are exposed to termite hazard. This is particularly true for plastic piping used for agricultural purposes and plastic-sheathed cables used for telephone or electrical supply. It is natural, therefore, that there should be considerable interest in the resistance to termite attack of plastics generally used for these and similar purposes, and it was to provide information on this that the present investigations were begun. Subsequently, the scope of the study was broadened to include a wider range of plastics and to investigate the effects of variations in manufacturing formulations and/or the addition of insecticidal materials during processing on the termite resistance of plastics.

^{*} Division of Entomology, CSIRO, Canberra.

Published information on the subject, although now assuming moderate proportions, is sometimes contradictory. This may be due to different species of termites being involved, or to variations in the type and formulation of a particular plastic investigated by different workers.

Wolcott (1946) records undiluted (unplasticized) cellulose acetate as being readily eaten by Cryptotermes brevis. He also found that the same species will eventually penetrate a film of 5% polymerized methyl methacrylate but is apparently unable to penetrate a film containing 20% solids of polymerized vinylidene chloride or one of polyvinyl acetate containing 55% total solids. Snyder (1955) found cellulose acetate was the only plastic of those he tested that was not attacked by termites. The test insects were species of Coptotermes, Heterotermes, and Reticulitermes. He also refers to termite attack on polyvinyl chloride coatings on underground cables and to termite penetration of both Neoprene and natural rubber insulations. A recent personal communication from Dr. Snyder refers to tests by the United States Department of Agriculture in which the following plastics were shown to be susceptible to termite attack: polyethylene, polyvinyl chloride, Neoprene, butyl rubber, and natural rubber. The least susceptible material was polyvinyl chloride, and thickness was considered to be an important factor in relation to susceptibility—the thicker the material, the lower the susceptibility. Additional tests showed that the incorporation of small amounts of cyclodienes, e.g. dieldrin, was effective in preventing attack. Colwill(1958) refers to tests in Nigeria in which nylon monofilaments were damaged by termites, and also notes the commercial use of metallic naphthenates for termite-proofing dielectrics such as polyvinyl chloride and polyethylene. He states that untreated dielectrics vary in their resistance to termite attack, and that those containing chlorine, e.g. polyvinyl chloride, seem relatively immune compared with non-chlorine compounds such as polyethylene. With polyethylene, the amount of damage appeared to depend on density, low-density polyethylene probably being more easily attacked than a high-density type.

Tests carried out by the Department of Forestry, Pretoria, South Africa, (Dr. P. D. M. Krogh, personal communication) showed that cable sheaths consisting of either polyethylene containing 10% polyisobutylene or polyethylene containing 10% butyl rubber were severely damaged, probably by *Macrotermes natalensis*. The inclusion of chemicals such as metallic naphthenates or pentachlorphenol during manufacture has not proved effective, possibly because of destruction or decomposition during the high-temperature extrusion of the polythene sheath.

The Southern African Section of the Plastics Institute, London, (Mr. J. N. Ratcliffe, personal communication) reports that sections of black and white polyethylene water pipe remained sound after 4½ years' exposure to high termite hazard in South Africa, whereas small-bore polyvinyl chloride piping was punctured by termites within 3 years. Reports of termite attack on telephone cables in the Central African Federation are conflicting, one report stating that polyethylene is attacked and polyvinyl chloride is not, and another the exact opposite. One of these reports claims that colour is important, black cable being least liable to attack and red cable most attractive.

The records of the Termite Research Unit, London, (kindly made available by Dr. W. V. Harris) include the following references to termite attack on plastics: (i) polyvinyl chloride strip used for wrapping electric cables in East Africa was severely

attacked in 17 months by species of *Odontotermes*; (ii) rubber-insulated polychloroprene-sheathed cable shorted after 4 months' use in Macao owing to termite attack; (iii) railway signal cable sheathed with Neoprene rubber, buried in the soil in Southern Rhodesia, was severely attacked after 6 weeks, but polyvinyl-chloride-coated cable buried in the same area was reported sound after a year, the termites responsible being *Macrotermes* or *Odontotermes*; (iv) plastic paint based on polyvinyl acetate was eaten by termites (probably *Microcerotermes diversus*) in Baghdad in 1956. Methods of protecting plastics against termite attack are reported to include the use of dieldrin in polyvinyl chloride and a mixture of aldrin and dieldrin in polyethylene. In a published account of termites in Europe, Harris (1962) refers to laboratory tests with the endemic species, *Reticulitermes lucifugus*, in which polyethylene sheeting and polyurethane foam were readily attacked.

Rychtera and Bartakova (1963) summarized data on termite attack on plastics from a wide variety of sources, and classified the various plastics as follows:

Resistant.— Epoxides, unplasticized polyvinyl chloride, polymethyl methacrylate, polyvinyl carbazole, phenol-melamine-aniline-formaldehydes.

Slightly attacked. - Polychlorotrifluoroethylene, polytetrafluoroethylene.

Markedly attacked.—Polyethylene, nylon, plasticized polyvinyl chloride, polyvinyl butyral, polypropylene.

Becker (1963, 1964) gives details of laboratory tests in which 50 plastics of different types were exposed to five species of termites belonging to five different genera. He found that (i) phenoplasts and aminoplasts are termite-resistant if they are hard enough and do not contain susceptible fillers, (ii) polyester, polyamide, polymethyl methacrylate, and epoxy resins are resistant, (iii) polyethylene, polystyrene, and polyvinyl chloride with a low plasticizer content are to a great extent resistant, and (iv) polyurethane, soft polyethylene, and plasticized polyvinyl chloride are susceptible. He considers that hardness of the material is of vital importance and that surface finish also affects practical performance.

Colwill (1964), in a report of the results of a world-wide questionnaire on pest damage to transmission lines and cables, refers to numerous instances of termite damage to polyethylene- and polyvinyl-chloride-sheathed and insulated cables. He also draws attention to the performance of a nylon-sheathed polyethylene-insulated cable in Malaya which suffered only one localized area of damage during 3 years' exposure to termites.

Pacitti (1965) surveyed the literature relating to termite attack on plastics and rubbers. He concludes that polymeric materials show considerable variation in their resistance to termite attack, and that this is due to physical factors such as hardness rather than to chemical composition.

In Australia there have been abundant instances of termite attack on plastics in service. Government departments, such as Postmaster-General's, Works, Supply, and Civil Aviation, have reported termite damage to plastic-sheathed and insulated communications and power cables, and manufacturers and their agents have reported many cases of attack on plastic piping used for irrigation, stock watering, or domestic water supplies. The plastics involved have been polyvinyl chloride, polyethylene, and

cellulose acetate butyrate, and where specific identifications have been made the termites responsible were *Coptotermes acinaciformis* or *Mastotermes darwiniensis*. These attacks have been observed in all mainland States, although almost all damage to plastic piping has been confined to the low-rainfall areas of the southern and south-western portions of the continent.

It is clear from the above summary that termite attack on plastics is quite widespread and that a number of different genera are capable of causing economic damage. No single plastic has yet proved completely resistant against a range of termites, and the commonest approach to proofing such materials is the incorporation of insecticidal compounds during processing.

The investigations reported here have been carried out over several years. Initially, test samples were obtained by canvassing Australian manufacturers and suppliers of plastic piping and cable sheathings and consisted mainly of representative material from normal production runs. In addition, however, occasional experimental batches were prepared for testing, usually to assess the value of insecticidal additives.

In 1958, a conference of representatives of the Plastics Institute of Australia, the Commonwealth Departments of Civil Aviation, Supply, and Works, and the CSIRO Division of Entomology was convened to consider the problem of termite attack on plastics and to plan research programmes. As a result, testing since that date has been increasingly concerned with experimental material specially formulated to check particular points.

II. MATERIAL AND METHODS

Almost all tests have been made using the standard laboratory colony technique developed in this Division (Gay et al. 1955), and employing Nasutitermes exitiosus (Hill), Coptotermes lacteus (Frogg.), and, to a lesser extent, Coptotermes acinaciformis (Frogg.). A limited number of tests was made with Mastotermes darwiniensis Frogg., in which samples of plastics were exposed to a large colony of several thousand individuals maintained in a metal tank in the laboratory.

The choice of test species of termites is governed by their economic significance, availability, and amenability to laboratory maintenance. In temperate Australia most termite damage is caused by *Coptotermes* spp. (mainly *C. acinaciformis* and *C. frenchi*) and *Nasutitermes exitiosus*, and in tropical Australia by *Mastotermes darwiniensis* and *Coptotermes acinaciformis*. Of these, only *M. darwiniensis* cannot be maintained satisfactorily in the small experimental groups necessary for an extensive laboratory testing programme, so tests with this species have necessarily been restricted to the type referred to above.

The more extensive use made of *C. lacteus* as a test insect compared to its more aggressive and voracious congener, *C. acinaciformis*, is based firstly on the convenience of being able to collect populous field colonies of the former species readily in areas where colonies of the economic species *N. exitiosus* are also common. Secondly, the Australian species of *Coptotermes* form a closely knit group with similar food preferences and susceptibilities to toxicants. For this reason *C. lacteus*, although never considered of economic significance throughout its restricted range of distribution in south-eastern Australia, is a useful guide to the performance of the economically important *C. acinaciformis*.

Test specimens consisted of short lengths (normally $3-3\frac{1}{2}$ in.) of plastic pipe, plastic-sheathed cable, or plastic sheet ($\frac{1}{2}$ -in.-wide strips). When plastic film was tested it was either wrapped around blocks of susceptible timber ($3\frac{1}{2}$ by $\frac{1}{2}$ by $\frac{1}{2}$ in.), or rolled into hollow cylinders ($\frac{1}{2}$ -in. diameter) and fastened with metal clips, or used as a sheet barrier (flat or folded) between an experimental group of termites without food and an adjacent food source (Fig. 1).

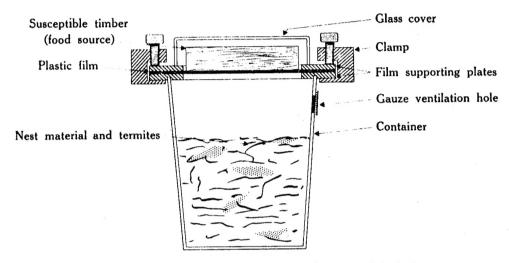


Fig. 1.--The experimental unit used for many of the tests of plastic films.

In the earlier tests in this investigation, the sheet, cable, or pipe samples were used without any special preparation after cutting to size, i.e. the cable and pipe samples had exposed ends and the sheet material exposed edges. It soon became obvious that termite attack generally started from the ends or edges of samples where presumably the termites could readily obtain purchase with their mandibles. In order to ensure the most rigorous test of a candidate plastic, it was necessary to mask the cut ends and edges of samples so that the termites were presented with only a flat or curved surface of plastic. This masking was done in a variety of ways: with sealing wax, epoxy resins, or metal edging or capping, and in the tabulated results given later such samples are referred to as having "capped ends" or "masked edges". Normally, four test samples were exposed in each standard colony, but with piping only a single sample was included. All materials were tested in duplicate colonies against each species of termite and the attack on test samples was recorded as both an actual and a percentage weight loss. The figures for these losses, given in Tables 1-7, represent the means of duplicate readings in each instance. In addition, visual assessments of the extent and nature of damage were made for most materials, using the following system:

Slightly attacked.—Penetration from the edge of the sample not exceeding 10% of the width of the sample, or excavation on the face of the sample not exceeding 10% of the thickness.

Attacked.—Penetration from the edge of the sample more than 10% but not exceeding 33% of the width, or excavation on the face of the sample more than 10% but not exceeding 33% of the thickness.

Badly attacked.—Edge penetration more than 33% but less than 66% of the width, or surface excavation greater than 33% but not exceeding 66% of the thickness.

Destroyed.—Edge penetration more than 66% of the width of the sample, or surface excavation exceeding 66% of the thickness.

III. RESULTS AND COMMENTS

(a) General Survey

The results may be considered most conveniently in separate groups, each of which represents a separate phase of the investigation. The first group concerns the plastics in most general use in Australia. These plastics, obtained from a variety of sources, were tested without any concern regarding their formulation or the nature of the sample, i.e. piping, sheet, or cable sheathing, in order to make a general survey of the termite susceptibility of plastics. It was felt that this information could serve as a useful guide to the most satisfactory utilization of plastics in situations where termite hazard exists. The results of this general survey are summarized in Table 1, from which the following conclusions may be drawn.

Susceptibility to termite attack varies considerably among the plastics in widespread use, ranging from virtually complete immunity to a high level of susceptibility. Polyvinyl chloride, in the semi-rigid or rigid conditions, either as sheeting or piping, is virtually unattacked, but when plasticized for use as cable sheathing or insulant or as tape, is very susceptible to attack (Fig. 2). Polyethylene, in low-density grades used for piping or cable sheathing, is readily attacked (Fig. 3), but the more recently developed high-density grades show a high resistance to termite damage. The epoxy and acetal resins tested are either highly resistant or immune to attack. Polyester resins also appear to be immune, and the small weight losses detected in these samples are considered to be due to causes other than termite attack. Cellulose acetate butyrate, both in sheet form and in piping, is readily attacked (Fig. 3). Natural rubber is slightly susceptible. All of the synthetic elastomers show some susceptibility to attack (especially Thiokol). The phenolic laminates examined are either highly resistant or immune. All grades of nylon tested are highly resistant and show no more than slight nibbling; this also occurs with polytetrafluorethane. Makrolon (a polycarbonic acid ester of 4,4'-dihydroxydiphenyl-2,2-propane) is immune to attack, as is high-impact polystyrene. Kralastic (a copolymer of styrenebutadiene-acrylonitrile) is susceptible to attack; polypropylene is slightly susceptible; polyvinylidene chloride (as film), polyurethane (as film), and polyisobutylene are very susceptible to attack. All the foamed or expanded plastics tested (polyvinyl chloride, polyurethane, polystyrene) are very susceptible to attack.

(b) Effect of Plasticizers

The marked difference in performance of plasticized and unplasticized polyvinyl chloride, as indicated in Table 1, led to an investigation of the effects of variations in

the level and nature of plasticizer on the termite resistance of the resultant product. Five tests were made using polyvinyl chloride sheet and one test with cellulose acetate butyrate rod. The results are summarized in Table 2.

It will be seen that in Test No. I unplasticized polyvinyl chloride was unattacked, but any of the plasticizer treatments resulted in some degree of termite attack. A statistical analysis of these results shows that all treatments are significantly different from each other. It may be concluded, therefore, that the addition of tricresyl phosphate to polyvinyl chloride makes it less susceptible to termites than if a similar quantity of dioctyl phthalate is added.

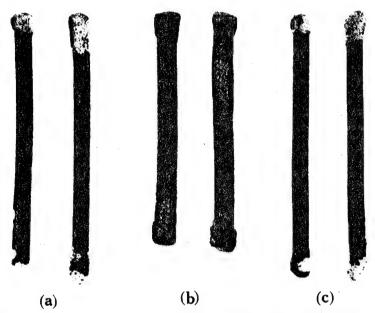


Fig. 2,—Various types of polyvinyl-chloride-sheathed cables after exposure to attack by *Coptotermes acinaciformis* in laboratory colonies. (a) Non-migratory PVC sheath; (b) Arctic PVC sheath; (c) general-purpose PVC sheath.

In Test No. 2 (Table 2) polyvinyl chloride plasticized with tricresyl phosphate is obviously much less susceptible to attack than when plasticized with an equal quantity of either dioctyl phthalate or di-isooctyl phthalate. This confirms the findings of the previous test; but such a result could be attributed simply to hardness, as the material plasticized with tricresyl phosphate has a British Standard hardness of 96 compared with a hardness of 90 for the material plasticized with either of the other two compounds.

This point was checked in Test No. 3 (Table 2) in which the levels of the two plasticizers were adjusted to give products of approximately the same hardness.

It is clear from these results that a reduction in the amount of either plasticizer (with an accompanying increase in hardness) produces a significant reduction in susceptibility to termite attack. Statistical analysis also indicates that polyvinyl chloride plasticized with tricresyl phosphate is significantly less susceptible than when

LABORATORY TESTS OF RESISTANCE OF VARIOUS PLASTICS AND RELATED MATERIALS TO ATTACK OF FOUR SPECIES OF TERMITES N.e., Nasutitermes exitiosus; C.l., Coptotermes lacteus; C.a., Coptotermes darwiniensis TABLE 1

Sheet (Grade 7 Alkathene), 0-125 in, thick Sheet Grade 7 Alkathene), 0-125 in, thick Sheet Grade 2 Okashrene), 0-125 in, thick As above -0-1-2, Suntainox (anti-oxidant), 0-5 in, sheet Sheet Grade 2 Okashrene) Sheet O-0625 in, thick, high density; Hotalien Grade 2 Okashrene Sheet O-0625 in, thick, high density; Hotalien Grade 2 Okashrene Sheet O-0625 in, thick, high density; Hotalien Grade 2 Okashrene Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolymer, based on 0-95 density Sheet O-0625 in, thick, Ehlylene-butylene copolym	Test No.	Details of Sample	No. and Type of Samples	Sp.	Amt. Eaten (g) (%)	Eaten (%)	Remarks
Sheet (Grade 20 Alkathene), 0-125 in. thick Alkattlene WJG-11 with 0-1% Nonox CI (anti-oxidant), 0-5 in. sheet Alkattlene WJG-11 with 0-1% Nonox CI (anti-oxidant), 0-5 in. sheet Sheet (0-5 in. thick. high density: Hosalen GM 5010) Sheet (0-5 in. thick. high density: Hosalen GM 5010) Sheet (0-625 in. thick. high density: Hosalen GM 5010) Sheet (0-625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density Sheet 0-0625 in. thick. Ethylene-butylene copo			Polyethylene				
S. Exposed edges	-	Sheet (Grade 7 Alkathene), 0·125 in. thick	8, Exposed edges	N.e.	0.22	2 · 1	Two samples slightly attacked, extensive nibbles on edges of 8
Sheet (Grade 20 Alkathene), 0-125 in, thick S. Exposed edges Ne. 0-24 2-1			8, Exposed edges	C.I.	08.0		Two samples badly attacked, 6 slightly attacked to attacked
8. Exposed edges		Sheet (Grade 20 Alkathene), 0·125 in. thick	8. Exposed edges	N.e.	0.24	2 · 1	Three samples slightly attacked, extensive nibbles on edges of 8
Akathene WJG-11 with 0 · 1 ° ° Nonox CI (anti-oxidant), 0 · 5 in, sheet 8. Exposed edges			8, Exposed edges	C.l.	0.79	7.5	Two samples badly attacked, 6 slightly attacked to attacked
8	C1	Alkathene WJG-11 with 0-1%, Nonox CI (anti-oxidant), 0-5 in. sheet		N.e.	0.02	0.05	Five samples with few nibbles on edges
As above - 0-1.", Nonox WSF (anti-oxidant), 0-5 in, sheet As above0-1.", Santanox (unti-oxidant), 0-5 in, sheet B. Exposed edges C. 0.08 S. Exposed edges C. 0.09 S. Exposed edges C. 0.013 S. Strips C. 0.015 S. Strips C. 0.034 S. Strips S. Strips C. 0.034 S. Strips C. 0.034 S. Strips S. Strips S. Strips C. 0.034 S. Strips S. Strips C. 0.034 S. Strips S. Str				C.1.	80.0	0.20	All samples with nibbles on edges and faces
8. Exposed edges		As above0·1", Nonox WSF (anti-oxidant), 0·5 in. sheet	8, Exposed edges	N.e.	9.0	80.0	Seven samples with few nibbles on edges
As above - 0 · 1 ° 5 santanox (anti-oxidant). 0 · 5 in. sheet 8. Exposed edges C. 1. 0 · 0.02 Sheet (0 · 5 in. thick, high density: Hostalen GM 5010) 6. Exposed edges C. 1. 0 · 13 Sheet 0 · 0625 in. thick. Ethylene-butylene copolymer, based on 0 · 95 density Sheet 0 · 0625 in. thick. Ethylene-butylene copolymer based on 0 · 95 density Strips C. 2. 0 · 157 Sheet 0 · 0625 in. thick. Ethylene-butylene copolymer based on 0 · 95 density Strips C. 1. 0 · 036 Sheet 0 · 0625 in. thick. Ethylene-butylene copolymer based on 0 · 95 density Strips C. 1. 0 · 037 Sheet 0 · 0625 in. thick. Ethylene-butylene copolymer based on 0 · 95 density Strips C. 1. 0 · 037 Sheet 0 · 0625 in. thick. Ethylene-butylene copolymer, based on 0 · 96 density Strips C. 1. 0 · 037 Sheet 0 · 0625 in. thick. Ethylene-butylene copolymer, based on 0 · 96 density Strips C. 1. 0 · 037 Strips C. 1. 0 · 037 C. 1. 0 · 037 As above 0 · 03. containing 2 ° acabon black (Rigidex pipe Strips C. 1. 0 · 037 Strips C. 1. 0 · 037 As above C. 1. 0 · 037 C. 0 ·			8, Exposed edges	C.I.	80.0	0.20	All samples with nibbles on edges and faces
Sheet (0.5 in, thick, high density; Hostalen GM 5010)		As above0.1% Santanox (anti-oxidant), 0.5 in. sheet	8, Exposed edges	N.c.	0.03	0.05	Seven samples with few nibbles on edges
Sheet (0-5 in. thick. high density: Hostalen GM 5010) 6, Exposed edges				C.I.	0.09	0.20	All samples with nibbles on edges and faces
6, Exposed edges	m	Sheet (0.5 in. thick, high density: Hostalen GM 5010)	6, Exposed edges	N.e.	9.0	0.10	Few nibbles on I sample only
Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density 8, Strips			6, Exposed edges	C.1.	0.13	0.35	Slight attack on edges of all samples
Sheet 0-0625 in. thick. Ethylene-butylene copolymer, based on 0-95 density 8, Strips			6. Exposed edges	C.a.	0.15	0.40	Slight attack on edges of all samples
8, Strips C.1. 0.038 0.57 Sheet 0.0625 in. thick. Ethylene-butylene copolymer based on 0.95 density Polymer of melt flow index 0.3 (Rigidex special pipe compound) Sheet 0.0625 in. thick. Ethylene-butylene copolymer, based on 0.95 density Strips C.2. 0.033 0.48 Strips C.3. 0.151 2.15 Sheet 0.0625 in. thick. Ethylene-butylene copolymer, based on 0.96 density Strips C.4. 0.151 2.15 Sheet 0.0625 in. thick. Ethylene-butylene copolymer, based on 0.96 density Strips C.4. 0.151 2.15 Sheet 0.0625 in. thick. Ethylene-butylene copolymer, based on 0.96 density Strips C.4. 0.151 2.15 Sheet 0.0625 in. thick. Ethylene-butylene copolymer, based on 0.96 density Strips C.4. 0.101 0.24 Strips C.4. 0.101 0.30 Sheet 0.003-in. thickness C.5. 0.102 2.60 Sheet 0.003-in. thickness C.6. 0.101 0.30 C.7. + + + + Colded C.7. + + Colded C.7. + Colded	4	Sheet 0.0625 in. thick. Ethylene-butylene copolymer, based on 0.95 density	8, Strips	N.C.	0.064	0.95	Slight attack on 6 samples, nibbles on 2
8, Strips Ca. 0-157 2-30 Sheet 0-0625 in, thick. Ethylene-butylene gopolymer based on 0-95 density R, Strips Strips Ca. 0-151 2-15 Sheet 0-0625 in, thick. Ethylene-butylene copolymer, based on 0-96 density R, Strips Ca. 0-151 2-15 Sheet 0-0625 in, thick. Ethylene-butylene copolymer, based on 0-96 density R, Strips Ca. 0-151 2-15 Sheet 0-0625 in, thick. Ethylene-butylene copolymer, based on 0-96 density R, Exposed edges N.c. 0-101 0-24 Strips N.c. 1-15 Strips Ca. 0-151 2-15 Strips Ca. 0-151 1-15 Strips Ca. 0-151 2-15 Strips			8, Strips	C.I.	0.038	0.57	Slight attack on 1 sample, nibbles on 7
Sheet 0-0625 in. thick. Ethylene-burylene çopolymer based on 0-95 density 8, Strips N.c. 0-034 0-49 Polymer of melt flow index 0-3 (Rigidex special pipe compound) 8, Strips C.1 0-033 0-48 Sheet 0-0625 in. thick. Ethylene-burylene copolymer, based on 0-96 density 8, Exposed edges N.c. 0-010 0-24 polymer, melt flow index 0-3, containing 2-6, carbon black (Rigidex pipe 8, Masked edges N.c. 0-010 0-30 N.c. 0-010 0-34 grade) 8, Masked edges N.c. 0-010 0-30 N.c. + + + + 1. Flat N.c. + + + 1. Flat N.c. + + + 1. Flat C.l. N.c. + + 1. Flat N.c. C.l. + + 1. Flat N.c. + 1. Fl			8, Strips	C.a.	0.157	$2 \cdot 30$	Slight attack to attack on 4 samples, nibbles on 4
Strips C.1. 0.033 0.48		Sheet 0.0625 in. thick. Ethylene-butylene copolymer based on 0.95 density	8, Strips	N.C.	0.034	0.49	Slight attack on 3 samples, nibbles on 5
8. Strips		polymer of melt flow index 0.3 (Rigidex special pipe compound)	8, Strips	C.I.	0.033	0.48	Slight attack on 2 samples, nibbles on 6
Sheet 0-0625 in. thick. Ethylene-burylene copolymer, based on 0-96 density 8. Exposed edges N.c. 0-101 0-24 polymer, melt flow index 0-3, containing 2-8, carbon black (Rigidex pipe 8, Masked edges N.c. 0-102 2-66 Ridden S. Exposed edges C.L. 0-102 2-66 Ridden S. Exposed edges C.L. 0-102 2-66 Film (Visqueen), 0-003-in. thickness L. Flat C.L. + + Film grade TF (0-002 in. thick) C.L. + + Film grade TF (0-002 in. thick) R. Film wrapped N.c. 0-10 S. Eilm wrapped N.c. 0-10 S. Ends masked N.c. 0-10 N.c. C.L. + + S. Film wrapped N.c. 0-10 S. Ends masked N.c. 0-10 N.c. C.L. + S. Film wrapped N.c. 0-10 S. Ends masked N.c. 0-10 S. As above C.L. 0-10 S. Ends masked N.c. 0-10 S. Standa N.c. 0-10			8. Strips	C.a.	0.151	2.15	Slight attack on 6 samples, nibbles on 2
Second to the containing 2° around black (Rigidex pipe 8, Masked edges N.c. Second to the containing 2° around black (Rigidex pipe 8, Masked edges C.1. 0.102 2.60		Sheet 0.0625 in. thick. Ethylene-butylene copolymer, based on 0.96 density	8. Exposed edges	N.c.	010.0	0.24	Nibbles on edges of all samples
grade) 8, Exposed edges C.1. 0·102 2·60 8, Masked edges C.1. 0·100 30 1, Flat N.c. + + + 1, Flat C.1. + + + 1, Flat C.1. +		polymer, melt flow index 0.3, containing 2% carbon black (Rigidex pipe	8, Masked edges	N.C.	•	*	No visible attack
S. Masked edges C.L. 0.010 0.30		grade)	8. Exposed edges	C.I.	0.102	2.60	Attack on I sample, slight attack on 6, nibbles on I
1, Flat N.c. + + + 1, Folded N.c. + + + 1, Folded N.c. + + + 1, Folded C.I. + + 1, Folded C.I. + 1, Folded C.I. + 2, Folded C.I. + 3, Flat C.I. + 4, Flat C.I. + 5, Flat C.I. + 6, Flat C.I. + 7, Flat C.I. + 8, Flat C.I. + 9, Flat C.I. 9, Flat C.I. 1, Folded C.I. 1, Folded C.I. 2, Flat C.I. 3, Flat C.I. 4, Flat C.I. 5, Flat C.I. 6, Flat C.I. 7, Flat C.I. 8, Flat C.I. 9, Flat C.I. 1, Flat C.I. 1, Flat C.I. 1, Flat C.I. 2, Flat C.I. 3, Flat C.I. 4, Flat C.I. 5, Flat C.I. 6, Flat C.I. 7, Flat C.I. 8, Flat C.I. 9, Flat C.I. 1, Flat C.I. 1, Flat C.I. 1, Flat C.I. 1, Flat C.I. 2, Flat C.I. 3, Flat C.I. 4, Flat C.I. 5, Flat C.I. 6, Flat C.I. 7, Flat C.I. 8, Flat C.I. 9, Flat C.I. 1, Flat C.I. 1, Fla			8. Masked edges	C.1.	0.010	0.30	Nibbles on faces and edges of 5 samples
1, Folded N.c. + + + 1, Folded C.l. + + + 1, Folded C.l. + + 1, Folded C.l. + 1, Folded C.d. + 1, Folded C.d. + 2, Film wrapped N.c. 3, Film wrapped N.c. 4	S	Film (Visqueen), 0.003-in. thickness	I, Flat	N.C.	+	+	Termites in contact with film, no visible damage
Flat C.L. + + Folded C.L. + Film, grade 7F (0.002 in. thick) Cable Film, grade 7F (0.00			1, Folded	N.C.	+	+	Three penetrations of film (2 on fold, 1 on flat)
Folded C.L. + + Folded C.L. + + Folded C.a. + + Folded C.a. + + Rolded C.a. + Rolded C			l, Flat	C.I.	+	+	Termites in contact with film, no visible damage
1. Flat C.a. + + + 1. Folded C.a. + + 2. Film. grade 7F (0.002 in. thick) 8. Film wrapped N.c. + 3. Film wrapped N.c. • 4. Samples C.a. + 5. Film. grade 7 0.05 0.2 6. Samples C.l. • 7. Samples C.l. 0.05 0.2 8. As above C.l. 0.10 0.53 8. As above C.l. 0.10 0.53			l. Folded	C.I.	+ -	+	One penetration of film on fold
1, Folded C.a. + +			i. Flat	C.a.	4-	+.	Termites in contact with film, no visible damage
Film, grade 7F (0.002 in. thick) 8. Film wrapped N.c. • • • • around timber samples C.l. • • •			1. Folded	C.a.	dr.	+	Five penetrations of film on fold
around timber samples Cable (Grade 7 polythene) Cable (Grade 7 polythene) Rear Samples Wax 8, As above C.I. 0 · 10 0 · 53	9	Film, grade 7F (0.002 in. thick)	8. Film wrapped	N.C.	•	*	20-80% of film destroyed
Cable (Grade 7 polythene) 8. Ends masked N.c. 0.05 0.2 with sealing wax 8, As above C.1. 0.10 0.53			around timber				
S. Ends masked N.c. 0.05 0.2 S. Ends masked N.c. 0.05 0.2 S. With sealing S. As above C.l. 0.10 0.53 S. As above			samples	C.1.	*	8	About 10% of film destroyed
1g C.l. 0·10 0·53	7	Cable (Grade 7 polythene)	8. Ends masked	N.c.	0.05	0.5	No visible attack, weight loss due to partial loss of wax seals
C.l. 0·10 0·53			with scaling				from samples
			8, As above	C.7.	0.10	0.53	Extensive surface attack on 7 samples

1	1	
ı	1	
•	•	

		8. As above	C.a.	09.0	1.50	Conductor exposed in 7 samples
	Cable (Grade 20 nolythene)	sked	N. P.	0.02	0.1	No visible attack, weight loss due to partial loss of wax seals
	Cable (Clade to polyment)			1		
		with sealing				Hom samples
		wax				
		8, As above	C.L.	10-0	9.0	Localized areas of slight attack on 5 samples
			Ca	69.0	3.11	Conductor exposed in all 8 samples
	Constitution of the state of th	chad	× ×	2	9	No vicible attack weight loss due to partial loss of way seals
	Cable (8/15% Grade 20 polythere 12.3% polythere)			5	3	to visible differs, respire to partial 1035 of run senio
		with sealing				from samples
		wax				
		8. As above	C.1.	9.0	90.0	Small areas of slight attack on 4 samples
		8 As above	00	1.94	4 - 15	Conductor exposed in 7 samples
c	Cath. the state of the description of section of the section of th	8 Lincapped		0.03	0.70	Nihiles on ends of sheath and core insulant
0	Cable, sneather with night-benefity polycury for some	e, circapped	;	3 .		
		8, Capped	4.6		•	No visible attack
		Uncapped	C.!.	0.078	0.50	Surface nibbles on ends of sheath and core insulant
		8, Capped	C.I.	*	*	No visible attack
		8. Uncapped	C.a.	0.275	1.97	Attack on ends of all 8 samples
		8 Canned	00	0.029	0.21	Slight attack on walls of 2 samples, nibbles on 3 more
		o Transa	;	200		With loss on and a new most of colds choose
		s, Uncapped	.v.e.	660.0	9 (Middles on ends and outer wall of cable sheath
	0.004 in. brass tape with 20% overlap and outer sheath of 0.040 in.	8, Capped	N. 6.	*	•	No visible attack
	clear, low grade polythene	8, Uncapped	C.I.	0.031	0.0	Nibbles on ends of sheath
		8, Capped	C.1.	0.027	0.07	Patches of nibbles on surface of outer sheathing
		8 Uncanned	00	0.00	0.52	Attack on ends of 3 samples, nibbles on walls of 1
		o Company	; (0.07		Click attack on units of 3 compiler nithbles on 1
		o, Capped	; ;	70.0	3 +	Silgit attach oil waits of 3 samples, moores our
6	Polythene-sheathed cable, PVC insulation-glass tape barrier (0.375 in.	8. Wax-sealed	N.e.	•	•	No visible attack
	diam.)	ends				
		8, As above	C.a.	*	*	Small isolated patches of surface roughening
10	Piping (natural Alkathene), 0.5 in. I.D.	2, Plugged ends	N.e.	*	*	No visible attack
		2, Plugged ends	C.I.	•	*	Slight surface nibbling on samples
		4. Physed ends	Ca	0.5	0.3	Penetration through wall of 2 samples
	District (Allest and anterest of district of the Interest of t	2 Plugged and	N	*	*	No visible attack
		2 Plugged ends	7	*	*	Slight surface nibbling on samples
			,	07.0		The second of the second of the second of
;		4, Flugged ends	C.a.	0.063		Extensive minoring, penetration of wall of a sample Click assess on and of complet extensive with his on walls
Ξ	11 Pipe (DuPont extruded)	z, Oncapped	. v.e.	550.0		Sugar attack on cites of samples, extensive modes on waits
		2, Capped	N.e.	0.003		Extensive nibbling on walls of samples
		2, Uncapped	C./.	900.0	Ó	Nibbles on ends of samples
		2, Capped	C.I.	•	*	No visible attack
		2, Uncapped	C.a.	0.025	0.23	Slight attack on ends of samples
		2. Capped	C.a.	*	*	No visible attack
		1. Uncapped	M.d.	0.0	80.0	Nibbles on ends of samples
12	High-density nining (1 in 1.D. 0.094 in, wall thickness)	2. Uncapped ends	N.e.	0.05	0.07	Nibbles on ends of samples
	9	2. Uncapped ends		0.01	90.0	Nibbles on ends of samples
	Low-density mining. Sample 1 (1 in. L.D., 0.094 in, wall thickness)	2. Uncapped ends	N.e.	80.0	0.31	Extensive nibbles to slight attack on ends of samples
		2. Uncapped ends		•	*	Nibbles on ends of samples
	Sample 2 (Lin ID 0:094 in wall thickness)	2. Uncanned ends		0.0	0.18	Nibbles on ends of samples
	Sample & (this i.e., o of the wan missings)	2 Uncanned ends		0.00	0.00	Nibbles on ends of samples
			;	,		

TABLE 1 (Continued)

Z S	Details of Sample	No. and Type of Samples	Test Sp.	Amt. (g)	Amt. Eaten (g) (%)	Remarks
		Polyethylene (Continued)	<i>d</i>)			
13	Piping, extra high density and tensile strength (1 in. I.D., 0.0625 in, wall	2, Uncapped ends		•	٠	No visible attack
		2, Uncapped ends	C.7.	2	0.28	Extensive nibbling on ends of samples
;		Polyvinyl Chloride				
14	Rigid sheet based on Corvic H.55,34 (0.0625 in. thick)	8, Exposed edges	N.e.	•	•	Traces of nibbles only on edges of some samples
		8, Exposed edges	C.I.	•	•	Traces of nibbles only on edges of some samples
	Semi-rigid sheet, based on Breon 202 with D.O.P. and dicyclohexyl phthalate	8, Exposed edges	N.e.	•	•	Traces of nibbles only, heavier than above
4	plasticizer (0.0625 in. thick)	8, Exposed edges	C.1.	•	•	Traces of nibbles only, heavier than above
2	rVC, unplasticized, impact-resistant with a percentage of chlorinated polyolefine (Hostalit Z, grey and yellow)	8, Sheet 0 · 094 in. thick	N.e.	0.024	91.0	Nibbling along edges of samples
		2, Uncapped, pipe	.C.I.	*	•	No visible attack
		U-194 In. wall				
		2, Uncapped, pipe 0.194 in. wall	C.a.	•	•	Few nibbles on ends of samples
		8, Sheet, 0 · 094 in.	C.a.	•	•	Nibbles on all samples, slight attack on 1
16	Electrical tape DOP TOP alacticized to cook to the state.	thick				
	when the court is presented (0.000 III, thick)	8, Lape wrapped around timber	N.e.	•	•	Approximately 25% of tape destroyed
	i	samples	C.L.		*	Annoximately 10% of tape destroyed
17	Film (Novon 700 series 18-20% plasticizer) 0.015 in. thick	2, Flat film	N.e.	+	+	Termites in contact with film no visible attack
		2, Flat film	C.T.	+	+	Termites in contact with film, no visible attack
-		2, Flat film	C.a.	+	+	Termites in contact with film, no visible attack
×	Foam, rigid expanded, 0.5 in. sheet	8, Strips	N.e.	0.242	9.75	All samples attacked, deeply channelled
		8, Strips	C.T.	0.075	3.07	All samples attacked
9		8, Strips	C.a.	•	•	All samples attacked
-	Cable (non-migratory PVC sheath)	8, Ends masked	.v.e.	0.14	0.38	No visible attack, weight loss due to partial loss of wax seals
		with sealing				from samples
		8 As above	1)	0.40	1.53	The state of the s
		8. As above	; e	9 -	2.95	Conductor exposed in a silf gramming
	Cable (Arctic PVC sheath)	8. Ends masked	N.e.	98.0	1.18	No visible attack weight loss due to partial loss of way and
		with sealing				from samples
		wax				
		8. As above	C.I.	00.1	1.41	Conductor exposed in 4 samples
		8, As above	C.a.	1 - 79	3.02	Conductor exposed in all 8 samples
	Capie (general purpose PVC sheath)	8, Ends masked	N.e.	0.21	0.62	No visible attack, weight loss due to partial loss of wax seals
		with scaling				from samples
		wax				
	~ .			0.37	1.07	Conductor exposed in 7 samples
	~	8, As above	C.a.	68.0	3.68	All samples badly attacked but conductor not exposed

13

	Cable (general purpose PVC insulant)	8, Ends masked	N.e.	10.0	0.05	No visible attack, weight loss due to partial loss of wax seals
		with scaling				from samples
		wax 8 As above	10	0.13	0.63	Five complee hadly attacked at ende
9	(mily 1) 5 (1) 1 (1) (1) (1)	9. Wax-saalad	, ×	•	•	No vicible attack
9		ends				NO VISIDIE ALIACK
		8, As above	C.I.	**	**	No visible attack
	Sample 2 (0.25 in. diam.)	8, Wax-sealed	N.e.	0.28	99.0	Five samples with conductor exposed
		ends				
		8. As above	C./.	0.17	0.39	Five samples with conductor exposed
21	PVC insulated wire, glass tape barrier, PVC sheath (0.375 in. diam.)	8. Wax-sealed	N.e.	80.0	0.2	Sheath penetrated on 1 sample
		ends				
		8, As above	C.a.	0.13	0.3	Sheath attacked in 5 samples
77	Cable, insulated with black PVC, no sheath, 7/064	8, Uncapped	N.e.	0.065	0.11	Slight attack on ends of 3 samples, nibbles on another 4
		8, Capped	N.e.	0.075	0.13	Slight attack on ends of 3 samples, mainly on Araldite seals
		8. Uncapped	C.I.	0.025	0.05	Nibbles on ends of 6 samples
		8, Capped	C.I.	0.089	91.0	Slight attack on end of 1 sample, several Araldite seals
						attacked
		8, Uncapped	C.a.	0.067	0.12	Attack on end of I sample, slight attack on ends of 4,
						nibbles on 1
		8, Capped	C.a.	0.064	0.12	Conductor exposed in 1 sample, attack mainly on Araldite
						seals
	Cable, insulated with black PVC, with PVC sheath, 7/.064	8, Uncapped	N.e.	0.223	0.27	Slight attack on ends of 3 samples, nibbles on another 3
		8. Capped	N.e.	0.160	0.21	Slight attack on walls of 2 samples, attack on another 1
		8, Uncapped	C.I.	0.370	0.50	Slight attack to attack on all 8 samples, conductor exposed in 1
		8, Capped	C./.	0.281	0.35	Slight attack on walls of 6 samples, nibbles on 2
		8, Uncapped	C.a.	0.540	0.75	Nine penetrations of sheath, exposing conductor
		8, Capped	C.a.	0.420	0.52	Seven penetrations of sheath, exposing conductor
23	Semi-rigid PVC extruded over a steel core (Mipolam)	8, Strips	N.e.	0.077		Samples showing nibbles to slight attack
		8, Strips	C.1.	0.075		Samples showing nibbles to slight attack
		8, Strips	C.a.	0.358	2.25	Samples showing slight attack to attack
24	ö	12, Uncapped	N.e.	•	•	No visible attack
	of 0.077 in.	12, Capped	N.e.	•	•	No visible attack
		Uncapped	C.I.	*	*	No visible attack
		12, Capped	C.I.	•	*	No visible attack
		12. Uncapped	C.a.	0.037	0.45	One sample destroyed (conductor exposed), others showing
						nibbles or slight attack
		12, Capped	C.a.	0.033	0.4	One-quarter of samples showing nibbles or slight attack
		3. Uncapped	M.d.	+	+	Samples slightly attacked to attacked
		3. Capped	M.d.	+-	+	Samples slightly attacked to destroyed (conductor exposed)
25	Rigid piping, 0.75 in. I.D.	2. Ends plugged	N.e.	*	•	No visible attack
		with rigid PVC				
		2, As above	C.I.	•	•	No visible attack
		4. As above	C.a.	++	++	No visible attack

TABLE 1 (Continued)

F						
No.	Details of Sample	No. and Type of Samples	Test Sp.	Amt.	Amt. Eaten	Remarks
		Polvaronvlene				
90	Shoot () . Sin think minima to an analysis as a con-		;			
4	Successory in thick, mixing of grades NS and AS)	Exposed edges	. e.	•	•	Traces of nibbles only
		6, Exposed edges	C.I.	0.21	95.0	Areas of slight attack on all edges
į		Exposed edges	C.a.	0.85	2.25	Extensive areas of slight attack on all edges
27	Sheet (0.0625 in. thick, Grade GPE 33)	8, Exposed edges	1.0	0.002	0.03	Edge nibbles on all samples
		8, Exposed edges	1.0	0.003	0.0	Nibbles on 1 sample only
		8, Exposed edges	C.I.	0.008	0.12	Nibbles on edges of all samples
		8. Exposed edges	C.T.	0.007	0.14	Nibbles on edges of all samples
		8. Exposed edges	C.a.	0.036	0.00	Extensive nibbles on edges of all samples
	Sheet (0.0625 in. thick, Grade HPE 35)	8. Exposed edges	N.e.	0.003	0.05	Edge nibbles on all samples
		8, Exposed edges	C.1.	900.0	0.10	Nibbles on edges of all samples
ć		8, Exposed edges	C.a.	0.035	09.0	Extensive nibbles on edges of all samples
87	Cable. Black polypropylene-covered 7 .044, with hard drawn copper con-	8. Uncapped	N. C.	0.002	0.007	Nibbles on end of I sample
	ductor, nominal radial thickness of 0.030 in. polypropylene cover	8, Uncapped	C.I.	0.025	0.10	Nibbles on ends of all samples
		8, Uncapped	C.a.	0.025	0.0	Slight attack on end of 1 sample, nibbles on 5 others
	Cable. Polypropylene-sheathed	8, Uncapped	1.0	0.039	1.0	Attack on insulant and sheath at one end
		8, Capped	1.6	*	*	No visible attack
		8, Uncapped	C.I.	0.050	0.35	Nibbles on ends of sheath and on core insulant
		8, Capped	C.1.	0.020	0.125	Nibbles on walls of 2 samples
		8, Uncapped	C.a.	0.310	2.1	Extensive attack on ends of 5 samples; nibbles on 3 more
ç		8, Capped	C.a.	190.0	0.45	Shallow areas of attack on walls of 3 samples
Ŷ.	riping (1 in. L.D., 0.0625 in. wall thickness: Garnite)	2, Uncapped ends	N.e.	*	•	No visible attack
		2, Uncapped ends	C.1.	0.01	0.07	Extensive nibbles on ends of samples
		2, Uncapped ends	C.a.	0 · 10	0.1	Slight attack to attack on ends of samples
;		Polystyrene				
Š	Polystyrene-butadiene alloy (high impact. 0·125 in. sheet)	8, Exposed edges	N.e.	++	+ 4	No visible attack
31	Expanded polyetyrene (Polyanta)	8. Exposed edges		* 6	• ;	No visible attack
,	ביירימונים סוייסיונים כן סויצטונים	 Exposed edges Exposed edges 	N.e. C.I.	0.09	10.8	
		Polyurethane				
2	Elastomer, for pipe sealing (with silica filler). 0.5 in. sheet	8, Strips	1.0.	0.303	0.45	Shallow patches of nibbles on all samples
		8, Strips	C.I.	0.984	1.40	Hole through I sample, patches of nibbles on remainder
11	Cable thanking (Const. 6001)	8. Strips	C.a.	1.085	1 - 40	Holes through 7 samples, nibbles on 1
2	Nack 1 " harring (Estane 38016, cured cross-linked, containing 10 % carbon black 1 " harring the carbon	8, Uncapped	C.1.	910.0	90.0	Nibbles on ends, 3 patches on walls
	סיים איני י סיים וחוון אורשן שוני)	8, Capped	 	0.013	0.0	Several small patches of nibbles on walls
		8. Uncapped	C.a.	0.001	10.0	Four areas of nibbles, 1 of slight attack on ends and walls
				}	2	Several parenes of sugnitariates on walls

		8. Strips	1	0.350 16.55	\$5.9	
	Polvether-prepolymer based foam, 2-3 lb cu ft density, 0.5 in, thick sheet	8, Strips	٠,	0.117	7.35	
		8, Strips	C.1.	0.463 2	20 - 40	
35	Foam sheet 0.5 in. thick (Esta-foam)	8. Exposed edges	1.6	0.43	15.2	All samples attacked
		8. Exposed edges	C.1.	0.66 2	21.8	All samples attacked
36	Lacquer film. 2 coats on susceptible timber	8. Exposed edges	.V. e.	+	+	Two samples slightly attacked through film
		8, Exposed edges	C.1.	-1	*) -	All samples badly attacked through film
		1. Exposed edges	M.d.	4-	4-	Sample badly attacked through film
		Nylon				
37	Nylon 6.5 (DuPont grade FM10.001), sheet 0.094 in. thick	8, Exposed edges	V. C.	•	•	No visible attack
		8. Exposed edges	C.I.	0.04	0.5	Slight roughening of edges of samples
38	Nylon 6 (Grilon), 0 · 5 in. sheet	8, Exposed edges		•	•	Isolated small patches of nibbles on edges of samples
		8, Exposed edges	C.1.	•	*	Traces of nibbles on edges of samples
		8. Exposed edges	C.a.	•	•	Extensive nibbles on edges of samples
36	Akulon polyamide, 0·125 in. sheet		N.e.	*	*	Scattered patches of nibbles on edges of some samples
			C.I.	•	*	Small patches of nibbles on edges of all samples
4	Nylon 6.6 (A100 E Black 937), 0 · 125 in. sheet	8. Exposed edges	N.C.	•	*	Isolated small patches of nibbles on edges of samples
			C.1.	*	*	Patches of nibbles on edges of samples
	Nylon 6.6 (A100 M Natural), 0·125 in. sheet		.V.c.	*	*	Isolated small patches of nibbles on edges of samples
		8, Exposed edges	C.1.	•	*	Patches of nibbles on edges of samples
	Nylon 610 (B100 C Natural). 0·125 in. sheet		1.0	•	*	Isolated small patches of nibbles on edges of samples
			C.I.	*	*	Patches of nibbles on edges of samples
	Nylon 610 (B102 C Brown, light stabilized). 0·125 in. sheet	8, Exposed edges	N.P.	*	*	Isolated small patches of nibbles on edges of samples
			C.I.	•	*	Patches of nibbles on edges of samples
4	High-tensile nylon, 0.02 in, sheet		N.e.	0.003	0.015	Slight attack on 1 sample, nibbles on edges of other 7
			C.I.	*	*	Nibbles on edges of 7 samples
			C.I.	•	*	No visible attack
			C.a.	0.025	1 · 20	Slight attack on 7 samples (from edges), nibbles on 1
		8. Masked edges	C.a.			No visible attack
		4, Exposed edges	M.d.	+ .	·ŀ	Nibbles on edges of all samples
		4	M.d.	+	+	No visible attack
42	ပဳ	ထံး	, ie	•		No visible attack
	pound containing 2% carbon black. (Airfield lighting cable)		C.L.	*	•	No visible attack
		8, Uncapped	C.a.	0.146	٠. د د	Attack on ends of 5 samples, nibbles on other 3
		8, Capped	C.a.	•	*	No visible attack
		2. Uncapped	M.d.	0.00	0.12	Nibbles on ends of both samples
		2. Capped	M.d.	•	•	No visible attack
43	Cable. Polythene-sheathed, with 0.030 in. thick nylon 11 jacket	Uncapped	.v.e.	0.015	0.5	Slight attack on sheath and jacket from ends
		2, Capped	V. 6.	*	•	No visible attack
		2, Uncapped	C.1.	0.056	6.5	Nibbles on ends of sheath
		2, Capped	C.1.	•	•	No visible attack
		Uncapped	C.a.	0.500	4.45	Attack on sheath and jacket from ends of all samples
		2, Capped	C.a.	•	•	No visible attack

TABLE 1 (Continued)

Test		No and Tone	100	,	Ame Fasse	
Š.	Details of Sample	of Samples	Sp.	(e)	(%)	Remarks
:		Nylon (Continued)				
#	Cable. Jacketed with nylon 610. insulated with polythene	8, Uncapped	N.e.	0.020	0.26	Slight attack on jacket and insulant at ends of samples only
		8, Capped	N.c.	•	*	No visible attack
		8, Uncapped	C.a.	0.191	2.46	Conductor exposed at ends of 4 samples, attack mainly on
			(insulant
45	Tubing. 0.25 in. O.D., nylon 11 (BESNO grade)	o, Capped	C.a.	700.0	60.0 0	Nibbles on jackets of all samples
		4. Capped		•	•	No visible attack
		4, Capped	; ;			No visible attack
		2. Uncanned	7. d.		*	No visible attack
		2. Capped	M.d.	•	•	No visible attack
		Cellulose Esters				
46	ŭ	8, Exposed edges	N.e.	0.42	1.85	Nibbles on edges of all camples
	thick)	8, Exposed edges	C.1.	0.27	-	Nibbles on edges of all samples
		8, Exposed edges	C.a.	0.41	6.1	All samples slightly attacked
	Cellulose acetate butyrate plasticized with 7% aliphatic azelate (0.094 in.	8, Exposed edges	N.e.	0.28	~	Nibbles on edges of all samples
	Trick)	8, Exposed edges	C.I.	0.22	6.0	Nibbles on edges of all samples
1,		8. Exposed edges	C.a.	0.43	2.0	All samples slightly attacked
†	Cellulose acetate butyrate piping, 0.75 in. f.D.	2, Ends plugged	N.C.	0.64	0.95	Areas of slight attack, penetration of pipe wall
		with C.A.B.				
		pushes				
		2, As above	C.I.	0.65	88.0	Areas of slight attack, penetration of pipe wall
48	Callulate accepte husbands (T II) to to 1	4, As above	C.a.	1.56	2.32	Several penetrations of pipe wall
2	Centrose acciate outyfate (Tentie II). (U-094 in. thick pipe wall)		N.C.	0.28	0.95	Nibbles on edges of samples
46	Pine. 1.25 in. O.D. cellulose acatate humana (Callidae Barra second max	8, Exposed edges		•	•	No visible attack
		-, Uncapped		0.021	0.72	Nibbles at ends of both samples
		2, Capped		*	*	No visible attack
		2, Uncapped		0.021	0.72	Nibbles on ends of both samples
		2, Capped		*	*	No visible attack
		2. Uncapped		0.325	1 · 12	Samples attacked at ends, several holes through walls
Ş	Callings and the second business and the Calling and the Calli	2, Capped		0.185	0.64	One hole through wall of one sample
2	0.0625 in wall this bases	2. Uncapped ends		0.05	0.38	Some nibbles on ends of samples
	o con in. wall tilleniess)	Uncapped ends	C.1.	80.0	9.0	Some nibbles on ends of samples
		2, Uncapped ends	C.a.	0.21	96.0	Three penetrations of walls, attack on ends of samples
		i, Circapped elius	.D. 14.	,	,	Nibbles on ends of sample
ï		Polyester Resins				
5	riastrene 37. unfilled (0·15 in. thick)	8, Exposed edges		0.07	0.15	Slight roughening of surface of samples
		8. Exposed edges	C./.	•	•	No visible attack

•	was accounted to the charge strengt may (0.10 in thick)	8. Exposed edges	, v.	0.77	0.58	Slight deterioration of surface and edges of samples
•		8, Exposed edges	C.L.	60.0	0.25	Slight deterioration of surface and edges of samples
-	Plastrene 37 - 65 % glass cloth (0-10 in. thick)	8, Exposed edges	N.e.	65.0	9-40	Slight deterioration of surface and edges of samples
•		8, Exposed edges	C.I.	0.58	1.55	Slight deterioration of surface and edges of samples
_	Plastrene 47 unfilled (0-15 in thick)	8, Exposed edges	1.6	0.24	09.0	Slight roughening of surface of samples
-		8, Exposed edges	C.J.	0.07	0.30	Slight roughening of surface of samples
_	Plastrene 47 47°; chopped glass strand mat (0-11 in. thick)	8. Exposed edges	N.e.	0.52	1.45	Slight deterioration of surface and edges of samples
-		8, Exposed edges	C.T.	96.0	1 - 15	Deterioration of surface of samples
_	Plastrene 47 68 % glass cloth (0·10 in. thick)	8, Exposed edges	N.e.	· 8	2.60	Slight deterioration of surface and edges of samples
-		8, Exposed edges	C.I.	1 -01	2.45	Deterioration of surface of samples
\$	Sheet 0.375 in. thick. Elexible isophthalic acid modified polyester resin	8, Strips	N.e.	*	•	No visible attack
		8, Strips	C.I.	•	•	No visible attack
-	Film (Melinex): 0.00175 in. thick	2. Flat	1.6.	+	+	Termites in contact with film, no visible damage
		2, Folded	1.0	+	+	Termites in contact with film, no visible damage
		2, Flat	C.I.	+	+	Termites in contact with film, no visible damage
		2, Folded	C.I.	+	+	Termites in contact with film, no visible damage
		2, Flat	C.a.	+	+	Termites in contact with film, no visible damage
		2, Folded	C.a.	+	+	Termites in contact with film, no visible damage
54	Epikote 828 - 8 % triethylene tetramine (0.22 in. thick)	8. Exposed edges	N.e.	*	•	No visible attack
		8. Exposed edges	C.I.	*	•	No visible attack
	Enikore 828 - 11% triethylene tetramine - 11% Diluent S - 1% di-tertiary	8. Exposed edges	N.P.	*	*	No visible attack
	butyl peroxide (0.25 in. thick)	8, Exposed edges	C.I.	•	•	No visible attack
	Epikote 834-25%. Diluent S-12.5% curing agent -2.5% di-tertiary	8, Exposed edges	N.e.	*	•	No visible attack
		8, Exposed edges	C.I.		•	No visible attack
	Epikote 834 + 6% piperidine (0.25 in. thick)	8, Exposed edges	N.e.	0.22	98.0	Traces of nibbles on surface of some samples only
		8. Exposed edges	C.I.	•	*	As above, but less evident
	Epikote 834 - 15% m-phenylenediamine (0.25 in. thick)	8, Exposed edges	N.e.	0.05	0.13	Traces of nibbles on surface of some samples only
		8, Exposed edges	C.1.	•	•	As above, but less evident
55	Pipe, 3 in. diam., 0.31-in. wall thickness (glass and acrylic fibre bonded with	4, Strips	N.e.	*	*	No visible attack
	thermo-setting epoxy resin)	4, Strips	C.	•	•	No visible attack
		4. Strips	C.a.	•	•	No visible attack
		1, Strips	M.d.	*	•	No visible attack
		Acetal Resins				
9	Sheet 0.094 in. thick (Defrin)	8, Strips	N.e.	•	*	No visible attack
		8. Strips	C.I.	•	•	No visible attack
		4, Strips	C.a.	0.004		Traces of nibbles on edges of all samples
27	Cable. Polyacetal copolymer jacket over polythene insulation	6. Uncapped	N.e.	0.022	0.32	Slight attack on jacket and insulant at ends of samples only
		6. Capped	N.C.	•		No visible attack
		6, Uncapped	C.a.	0.318	4.65	Conductor exposed at ends of 5 samples, mainly through
						attack on insulant
		6, Capped	C.a.	*	*	No visible attack

TABLE 1 (Continued)

Etastomers ges N.e. 0.55 0.70 ges C.a. 0.71 0.90 ges C.a. 0.71 0.90 ges C.a. 0.71 0.90 ges C.a. 0.74 0.85 ges C.a. 0.74 0.85 ges C.a. 0.75 1.15 ges C.a. 0.77 1.15 ges C.a. 0.77 1.23 ges C.a. 0.77 1.23 ges C.a. 0.77 1.25 ges C.a. 0.77 1.26 g	ž ž	Details of Sample	No. and Type of Samples	So	Amt.	Amt. Eaten	Remarks
Natural rubber (cable sheath. Stock No. 22511) 0-5-in. square strips Natural rubber (cable sheath. Stock No. 22511) 0-5-in. square strips Natural rubber. Shore hardness 70 (0-5 in. thick) Natural rubber. Shore hardness 80 (0-125 in. sheet) Polychloroprene (Neoprene). Shore hardness 60: (0-25 in. sheet) Polychloroprene (Neoprene). Shore hardness 60: (0-25 in. sheet) Natural rubber. Shore hardness 60: (0-125 in. thick sheet) Natural rubbers Polychloroprene (Neoprene). Shore hardness 60: (0-125 in. thick sheet) Natural rubbers Duralon 18. Shore hardness 80: (0-125-inthick sheet) Natural rubbers Duralon 18. Shore hardness 80: (0-125-inthick sheet) Natural rubber (Thiokol 1254B, sheet). Shore hardness 70: 8. Exposed edges 70: 0-16 Natural rubber: Natural rubbers Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-16 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 8. Exposed edges 70: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 0-17 Natural rubber (Thiokol 1254B, sheet). Shore hardness 55: 0-17 Natural rubber (Thiokol 12			al and Synthetic Ela	stomer	١.		
Natural rubber. Shore hardness 70 (0-5 in, thick) Natural rubber. Shore hardness 70 (0-5 in, thick) Natural rubber. Shore hardness 60: (0-25 in, sheet) Natural rubber. Shore hardness 60: (0-12 in, sheet) Natural rubber. Shore hardness 60: (0-12 in, sheet) Natural rubbers	28		8. Exposed edges	N.e.		0.70	I ocalized areas of slight attack on sometime
Natural rubber. Shore hardness 70 (0-5 in. thick) Se Exposed edges (2a. 0-71 0-90 8, Exposed edges (2b. 0-190 8, Exposed edges (2b. 0-190 1-90 8, Exposed edges (2b. 0-180 1-190 1-190 8, Exposed edges (2b. 0-180 1-18			8. Exposed edges	C.1.	0.55	0.72	Localized areas of slight attack on samples
Polychloroprene (Neoprene). Shore hardness 60: (0.25 in. sheet) Responsed edges No. (0.34 0.85 8. Exposed edges No. (0.45 1.15 8. Exposed edges No. (0.45 1.15 9.16 0.45 8. Exposed edges No. (0.46 0.45 9.15 0.45 0.45 0.45 0.45 0.45 0.45 0.45 0.4	3		8. Exposed edges	C.a.	0.71	06.0	Localized areas of slight attack on samples
Polychloroprene (Neoprene). Shore hardness 60 (0.25 in. sheet) Polychloroprene (Neoprene). Shore hardness 60 (0.25 in. sheet) Polychloroprene (Neoprene). Cable sheath, 0.44 in. diam. Reposed edges C.I. 0.16 0.71 Polychloroprene (Neoprene). Cable sheath, 0.44 in. diam. Reposed edges C.I. 0.16 0.71 Polychloroprene (Neoprene). Cable sheath, 0.44 in. diam. Reposed edges C.I. 0.16 0.71 Polychloroprene (Neoprene Cable sheath, 0.44 in. diam. Kralastic piping 0.0623 in. thick (Esso buryl rubber) Reposed edges C.I. 0.17 1.8 Reposed			Exposed edges	1.0	0.80	1.90	Small patches of attack up to 0.06 in. deep
Polychloroprene (Neoprene). Shore hardness 60' (0-25 in. sheet) Resposed edges Ca. R			8. Exposed edges	C:1	0.34	0.85	Small patches of nibbles and slight attack
Polystinotoprene (Neoprene). Shore hardness 60' (0-25 in. sheet) Polyster isocyanate synthetic rubbers Duration 18. Shore hardness 65' (0-125-inthick sheet) Duration 18. Shore hardness 80' (0-125-inthick sheet) Buration 19. Shore hardness 80' (0-125-inthick sheet) Bur	9		8, Exposed edges	C.a.	0.36	1.15	Five samples with areas of slight attack
8. Exposed edges C.1. • • • • • • • 8. Exposed edges C.1. • • • • • • 8. Exposed edges C.2. • • • • • • • • • • • • • • • • • •	3	rolychioroprene (Neoprene). Shore hardness 60' (0.25 in. sheet)	8. Exposed edges	N.e.	91.0	0.45	Scattered patches of attack up to 0.06 in deep
8. Exposed edges Ca. 8. Wax-sealed N.e. 0-04 0-17 and s. Wax-sealed N.e. 0-04 0-17 and s. Wax-sealed N.e. 0-04 0-17 and s. Wax-sealed C.l. 0-16 0-71 and s. Wax-sealed C.l. 0-16 0-71 and s. Wax-sealed C.l. 0-15 0-71 1-8 0-72 0-72 0-72 0-72 0-72 0-72 0-72 0-72			8. Exposed edges	C.I.	•	*	Small isolated patches of nibbles
8. Wax-sealed N.e. 0-04 0-17 ends Polyster isocyanate synthetic rubbers Duration 18 40. Shore hardness 65* (0-125-in-thick sheet) Buration 18 40. Shore hardness 65* (0-125-in-thick sheet) Buration 18 5. Shore hardness 65* (0-125-in-thick sheet) Buration 18 6. Shore hardness 65* (0-125-in-thick sheet) Buration 19 7. Shore hardness 70* 8. Exposed edges 7. 1. 0-53 2. 35 Polysulphide rubber (Thiokol 25348, sheet). Shore hardness 70* 8. Exposed edges 7. 1. 0-47 2. 35 Polysulphide rubber (Thiokol 25348, sheet). Shore hardness 55* 8. Exposed edges 7. 1. 0-69 0-9 Polysulphide rubber (Thiokol 25348, sheet). Shore hardness 55* 8. Exposed edges 7. 1. 0-47 2. 35 Sheet. 0-03 in. thick (Esso buryl rubber) Copolymer of styrene-butadiene-acrylonitrile, with carbon black 1 in. 1. D., 2. Uncapped ends 7. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	19	Dolochic	8. Exposed edges	C.a.	*	*	Small areas of nibbles on edges of all samples
8. wax-sealed C.L. 0-16 0-71 Poly-ster isocyanate synthetic rubbers Duralon 18 40. Shore hardness 65: (0-125-inthick sheet) Buralon 18 5. Shore hardness 67: (0-125-inthick sheet) Buralon 18 5. Shore hardness 80: (0-125-inthick sheet) Buralon 30. Shore hardness 80: (0-125-inthick sheet) Buralon 30. Shore hardness 80: (0-125-inthick sheet) Buralon 30. Shore hardness 94: (0-125-inthick sheet) Buralon 30. Shore hardness 70: 8. Exposed edges 7.6. 0-65 3-135 Buralon 30. Shore hardness 70: 8. Exposed edges 7.6. 0-67 2-15 Buralon 30. Shore hardness 70: 8. Exposed edges 7.6. 0-67 2-15 Buralon 30. Shore hardness 70: 8. Exposed edges 7.6. 0-67 2-15 Buralon 30. Shore hardness 70: 8. Exposed edges 7.6. 0-17 1-18 Sheet. 0-03 in. thick (Esso butyl rubber) Buralon 30. Shore hardness 55: 8. Exposed edges 7.6. 0-17 1-18 Sheet. 0-03 in. thick (Esso butyl rubber) Buralon 30. Shore hardness 55: 8. Exposed edges 7.6. 0-17 1-18 Sheet. 0-03 in. thick (Esso butyl rubber) Buralon 30. Shore hardness 55: 8. Exposed edges 7.6. 0-17 1-18 Sheet. 0-03 in. thick (Esso butyl rubber) Buralon 30. Shore hardness 55: 8. Exposed edges 7.6. 0-10 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40. Shore hardness 55: 8. Exposed edges 7.6. 0-10 Buralon 40.	5	organication (Neoprene), cable sheath, 0.44 in. diam.	8, Wax-sealed	N.e.	0.04	0.17	Two samples attacked, nibbles on other 6
Polyester isocyanate synthetic rubbers Duration 18 40. Shore hardness 65: (0.125-inthick sheet) Buration 18 5 hore hardness 80: (0.125-inthick sheet) Buration 18. Shore hardness 80: (0.125-inthick sheet) Buration 30. Shore hardness 80: (0.125-inthick sheet) Buration 40: (0.125-inthick sheet) Burations 60: (0.125-			ends				
Polysater isocyanate synthetic rubbers Duralon 18 40. Shore hardness 65: (0-125-inthick sheet) Buralon 18 Shore hardness 80: (0-125-inthick sheet) Buralon 19 Shore hardness 80: (0-125-inthick sheet) Buralon 19 Shore hardness 80: (0-125-inthick sheet) Buralon 19 Shore hardness 94: (0-125-inthick sheet) Buralon 19 Shore hardness 94: (0-125-inthick sheet) Buralon 19 Shore hardness 95: (0-125-inthick sheet) Buralon 19 Shore hardness 94: (0-125-inthick sheet) Buralon 20 Shore hardness 95: (0-125-inthick sheet) Buralonsed edges 71: (0-125-inthick sheet) Buralonsed edges 72: (0-125-inthick sheet) Buralonsed edges 72: (0-127-inthick sheet)			8. Wax-sealed	C.I.	91.0	0.71	Conductor exposed in 3 samples
Second edges N.e. 0.32 1.65	62	Polyester isocyanate synthetic rubbers	ends				
Buralon 18. Shore hardness 80 (0.125-inthick sheet) Buralon 30. Shore hardness 84 (0.125-inthick sheet) Buralon 30. Shore hardness 94 (0.125-inthick sheet) Buralon 30. Shore hardness 70 (1.56 3.35) Buralon 4. Shore hardness 55 (1.56 3.35) Buralon 5. Shore hardness 55 (1.56 3.35) Buralon 6. Shore 6. Shore hardness 55 (1.56 3.35) Buralon 6. Shore hardness 55 (1.56 3.35) Buralon 8. Exposed edges 7. Shore 1. S		Duralon 18 40. Shore hardness 65: (0-125-inthick sheet)	8. Exposed edges		0.33	1.65	Nihhlas danata
Separation 18. Shore hardness 80 (0-125-in-thick sheet) S. Exposed edges N.c. 0-43 1-80			8. Exposed edges		0.53	2.85	Nibbles or of the Samples
8. Exposed edges C.L. 0.65 3-35 9. Polychloroprene (Neoprene 2543A, sheet) Shore hardness 70° S. Exposed edges C.L. 0.47 2-20 1. Polysulphide rubber (Thiokol 2534B, sheet). Shore hardness 55° S. Exposed edges C.L. 0.26 2-6 2. Polyced edges C.L. 0.26 2-6 3. Exposed edges C.L. 0.26 2-6 4. Exposed edges C.L. 0.26 2-6 5. Exposed edges C.L. 0.26 2-6 6. Exposed edges C.L. 0.26 2-6 7. Exposed edges C.L. 0.26 2-6 8. Exposed edges C.L. 0.26 2-6 9. Exposed edges C.L. 0.27 0.85 1-6 9. Exposed edges C.L. 0.47 0.47 0.47 0.47 9. Exposed edges C.L. 0.47 0.47 0.47 9. Exposed edges C.L. 0.47 0.47		Duralon 18. Shore hardness 80 (0-125-inthick sheet)	8. Exposed edges	N. C.	0.36	08-1	Nibbles on edges and faces of all samples
S. Exposed edges N.c. 0.43 2.20				C.I.	0.65	3.35	Nibbles on edges and faces of all camples
8. Exposed edges		Duration 30. Shore hardness 94 (0.125-inthick sheet)	8. Exposed edges	1.6	0.43	2.20	Nibbles on edges and faces of all samples
Polysulphide rubber (Thiokol 25348, sheet). Shore hardness 70° 8, Exposed edges N.e. 0.09 0.9 Polysulphide rubber (Thiokol 25348, sheet). Shore hardness 55° 8, Exposed edges C.l. 0.26 2.6 Sheet. 0.03 in, thick (Esso butyl rubber) 2, Flat N.e. + + 2, Folded N.e. + + 2, Flat C.l. + + 2, Flat C.l	7	Dolonk	8. Exposed edges	C.7.	0.47	2.35	Nibbles on edges and faces of all samples
Sheet. 0-03 in. thick (Esso buryl rubber) Sheet. 0-04 in. thick in. thick in. thick in. I.D., 2. Uncapped ends N.c. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	3	objection options (Neoprene 2343A, sheet). Shore hardness 70-	8, Exposed edges	N.e.	60.0	6.0	Isolated patches of nibbles on samples
Sheet. 0.03 in. thick (Esso butyl rubber) Sheet. 0.04 in. the copolymer of styrene-butadiene-acrylonitrile, with carbon black I in. I.D., 2. Uncapped ends N.c. 0.01 0.06 N.c. 10.00	44		8, Exposed edges	C./.	0.26	5.6	Three samples slightly attacked
8. Exposed edges C.1. 2.08 22.4 2. Flat X.c. + + 2. Folded X.c. + + 3. Flat C.1. + + 4. Flat C.1. + 5. Flat C.1. + 5. Flat C.1. + 6. Flat C.1. + 7. Folded C.1. + 8. Exposed edges C.1. 5. 9. Flat C.1. + 9. Flat C.2. + 1. Folded C.1. + 1. Folded C.1. + 2. Folded C.1. + 3. Flat C.2. + 4. Flat C.2. + 5. Flat C.2. + 6. Flat C.2. + 7. Flat C.2. + 8. Flat C.2. + 9. Flat C.2. + 9. Flat C.2. C.2. 9. Flat C.2. C.3. 1. Flat C.2. C.3. 1. Flat C.2. C.3. 1. Flat C.2. C.3. 2. Flat C.2. C.3. 3. Flat C.2. 4. Flat C.2. 5. Flat C.2. 6. Flat C.2. 6. Flat C.2. 7. Flat C.2. 8. Flat C.2. 9. Flat C.3. 9. Flat	ţ		8, Exposed edges	N.C.	0.17	8 - 1	Two samples attacked, 6 with nibbles
Copolymer of styrene-butadiene-acrylonitrile, I in. diam. Kralastic piping 2. Felf-cup (C.a., p. 1). Copolymer of styrene-butadiene-acrylonitrile, I in. diam. Kralastic piping 2. Self-cupped ends (C.a., p. 1). Copolymer of styrene-butadiene-acrylonitrile, I in. diam. Kralastic piping 2. Self-cupped ends (C.a., p. 1). Copolymer of styrene-butadiene-acrylonitrile, I in. diam. Kralastic piping 2. Self-cupped (C.a., p. 1). Copolymer of styrene-butadiene-acrylonitrile, I in. diam. Kralastic piping 2. Self-cupped (C.a., p. 1). Copolymer of styrene-butadiene-acrylonitrile, I in. diam. Kralastic piping 2. Self-cupped (C.a., p. 1). Copolymer of styrene-butadiene-acrylonitrile, I in. diam. Kralastic piping 2. Self-cupped (C.a., p. 1).	59	Shoet 0.03 in which (Econ Lead and	8. Exposed edges	C.1.	3.08	22.4	All samples slightly to badly attacked
2, Folded N.c. + + + 2, Folded N.c. + + + 2, Folded C.L. + + + 1, Folded C.L. + + + + 2, Folded C.L. + + + + 2, Folded C.L. + + + 1, Folded C.L. + + + + + 1, Folded C.L. + + + + + 1, Folded C.L. + + + + + + 1, Folded C.L. + + + + + + 1, Folded C.L. + + + + + + + 1, Folded C.L. + + + + + + + + + + + + + + + + + +)	Success of the titler (ESSO buly) rubber)	2. Flat	1.0.	÷	+	Termites in contact with sheet, no visible attack
Copolymer of styrene-butadiene-acrylonitrile, with carbon black 1 in. 1.D., 2. Folded C.a. + + + Capolymer of styrene-butadiene-acrylonitrile, with carbon black 1 in. 1.D., 2. Uncapped ends N.c. 0.01 0.06 2. Uncapped ends C.l. • • Copolymer of styrene-butadiene-acrylonitrile, 1 in. diam. Kralastic piping 2. Self-cupped N.c. • • Incapped ends C.a. • • • • • • • • • • • • • • • • • •			2, Foided	.V.C.	+	+	Termites in contact with sheet, surface nibbles on fold
2. Folded C.1. + + + 2. Folded C.2. + + + 2. Flat C.a. + + + + 4. Ended C.a. + + + 1. Flat Copolymer of styrene-butadiene-acrylonitrile, with carbon black 1 in. 1.D., 2. Uncapped ends N.c. 0.01 0.06 2. Uncapped ends C.1. • • • C.1. Copolymer of styrene-butadiene-acrylonitrile, 1 in. diam. Kralastic piping 2. Self-cupped N.c. • • • • • • • • • • • • • • • • • •			2, Flat	C.1.	- -	+	Two penetrations of sheet and several areas of attack
Copolymer of styrene-butadiene-acrylonitrile, with carbon black 1 in. I.D., 2, Uncapped ends N.c. 0.01 0.06 Kralastic piping 0.0625 in. wall Copolymer of styrene-butadiene-acrylonitrile, 1 in. diam. Kralastic piping 2. Self-cupped ends C.A. • • • Copolymer of styrene-butadiene-acrylonitrile, 1 in. diam. Kralastic piping 2. Self-cupped ends C.A. • • • • • • • • • • • • • • • • • •			2, Folded	C.1.	-1-	4-	Thirteen penetrations of sheet
Copolymer of styrene-butadiene-acrylonitrile, with carbon black Lin. L.D., 2, Uncapped ends N.c. 0.01 0.06 Kralastic piping 0.0625 in. wall 2, Uncapped ends C.l. • • • • • • • • • • • • • • • • • •			2, Flat	C.a.	+	+	Termites in contact with sheet, no visible attack
Copolymer of styrene-butadiene-acrylonitrile, with carbon black 1 in. I.D., 2, Uncapped ends N.c. 0.01 0.06 Kralastic piping 0.0625 in. wall 2. Uncapped ends C.l. • • 2. Uncapped ends C.l. • • 2. Uncapped ends C.l. • • 2. Selecapped N.c. • • ends 2. As above C.l. • •			2. Folded	C.a.	+	+	One penetration of sheet, several areas of nibbles
Copolymer of styrene-butadiene-actylonitrile, with carbon black 1 in. 1.D., 2, Uncapped ends N.c. 0.01 0.06 2. Uncapped ends C.l. • • 2. Self-capped N.c. • • • • • • • • • • • • • • • • • •	,	-	Various Plastics				
Copolymer of styrene-butadiene-actylonitrile, I in. diam. Kralastic piping 2, Self-capped and S. C	9	Copolymer of styrene-butadiene-acrylonitrile, with carbon black 1 in. I.D.,	2, Uncapped ends	N.c.	10.0	90.0	Traces of nibbles on ends of both samples
2. Uncapped ends C.a. 2. Copolymer of styrene-butadiene-actylonitrile, 1 in. diam. Kralastic piping 2. Self-capped N.e. ends ends 2. As above C.l. 2. As above C.a. 0.22 0.85		relation piping 0.0023 in, wall	2. Uncapped ends	C.1.	*	*	Traces of nibbles on ends of both samples
Coperation of spirite constitution of the contract of the cont	22	Constant of creams beautions and beautiful or an arministration	2, Uncapped ends	C.a.	•	*	Extensive surface nibbles on both samples
C.l. * * C.a. 0.22 0.85		erections of system-backgrounding, this diam. Kralastic piping	2. Self-capped	V.0.	•	•	No visible attack
C.a. 0.22 0.85			2, As above	C.I.	•	•	No vicinia agrada
			2. As above	C.a.	0.22	0.85	Extensive areas of slight attack up to 0.03 in door

89	68 Polyvinylidene chloride (0·0015-in. film)	ilm)	8. Film wrapped .V.e. around timber	V.e.	•	•	30-60°, of film destroyed
			samples	C.1.	•	•	Approximately 30°, of film destroyed
69	69 Polycarbonic acid ester of 4.4'-diby	4.4'-dihydroxydiphenyl 2,2-propane, 0:18 in. 8, Exposed edges	. 8. Exposed edges	V. C.	*	•	No visible attack
6			8. Exposed edges	C.I.	•	•	No visible attack
			8, Exposed edges	C.a.	++	++	No visible attack
20	20 Polvisobutviene sheet 0-094 in. thick		8. Exposed edges C.a. 0.61	C.a.	0.61	3.60	Six samples attacked, 2 slightly attacked
			8, Masked edges C.a. 0.31	C.a.		1.80	Three samples attacked (holes through sheet), 2 slightly
							attacked
7.	71 Polytetrafluorethane sheet 0.0625 in thick (Emralon)	thick (Emralon)	8. Masked edges C.I.	C.J.	•	•	Nibbles on face of 5 samples
			8, Exposed edges C.l.	C.I.	0.004 0.03	0.03	Nibbles on edges of all samples
			8, Exposed edges C.a.	C.a.	0.075	0.49	Nibbles on edges of all samples
7.	72 Phenol-naper Jaminate, ammonia-catalysed, 0.0625 in, thick	talvsed, 0.0625 in, thick	8, Exposed edges	N.e.	*	•	No visible attack
•			8, Exposed edges	C.I.	*	*	No visible attack
	Cresol-paner laminate, ammonia-catalysed, 0.18 in. thick	talvsed, 0-18 in, thick	8. Exposed edges	V.P.	*	•	No visible attack
			8, Exposed edges	C.I.	*	*	No visible attack
	Cresol-fabric laminate, ammonia-catalysed, 0.25 in. thick	talysed, 0.25 in. thick	8, Exposed edges N.e. 0.57 1.3	N.e.	0.57	1.3	Roughening of surface on all samples
			8, Exposed edges C.l. 0.22 0.5	C.I.	0.22	0.5	Roughening of surface on all samples
	* No measurable weight loss.	+ Samples not weighed. + Sm	all weight loss recorde	ed but	not conf	irmed b	. Small weight loss recorded but not confirmed by visual appearance of sample.

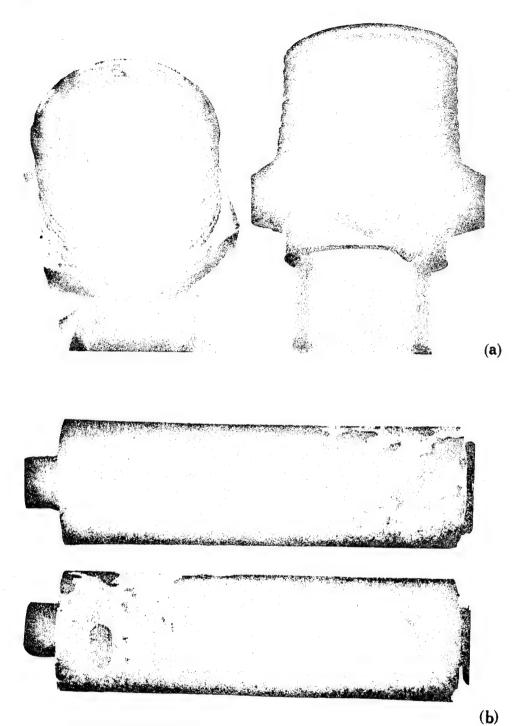


Fig. 3.—Samples of plastic piping after exposure to attack by *Coptotermes acinaciformis* in laboratory colonies. (a) Cellulose acetate butyrate; (b) polyethylene.

plasticized with dioctyl phthalate, irrespective of whether the level of tricresyl phosphate is adjusted to give a final product of equivalent hardness to that achieved using dioctyl phthalate. This finding must be treated with some reservation, however, as the compounds were matched for hardness at 20°C and tested at 26°C. The difference of 6 degC is sufficient to cause an appreciable variation in hardness, which will be different for each of the plasticizers.

In Test No. 4 (Table 2) the surface coating of polyurethane apparently delayed the initiation of attack. However, it is again evident that comparable susceptibility of polyvinyl chloride to termite attack occurs with lower levels of dioctyl phthalate and

di-isooctyl phthalate plasticizers than with tricresyl phosphate.

Test No. 5 (Table 2) gives further proof of the decrease in termite resistance of polyvinyl chloride as the level of plasticizer rises. A point of interest here is the reversal in the trend of increasing susceptibility in the C. lacteus test, as the plasticizer level was raised from $59 \cdot 5$ to $69 \cdot 5$ parts per 100 parts resin. Survival figures for the experimental colonies indicated that no toxic effect was involved, and it is possible that a repellent action is operating.

In the cellulose acetate test there are four variables, any or all of which could conceivably affect the resistance of this material to termite attack. These four variables are colour (dyes or pigments), acetyl range (medium, high, or extra high), plasticizer range (low or medium), and plasticizer type (phthalate or phthalate plus phosphate). The significance of these factors was checked by a statistical analysis of the data which showed (i) that there is no difference in the resistance of cellulose acetate to attack whether the colour is due to dyes or to pigments, (ii) that phthalate plasticizer gives a more resistant product than phthalate plus phosphate plasticizer, (iii) that a low plasticizer range gives better termite resistance than a medium range, and (iv) that a high acetyl range yields a more resistant product than a medium acetyl range but an extra high range is no better than a high range. There is interaction between the three variables, plasticizer type, plasticizer range, and acetyl range, and the most satisfactory combination to increase the termite resistance of cellulose acetate is high acetyl range, low plasticizer range, and phthalate plasticizer.

Two conclusions may be drawn from this series of tests on the effects of plasticizer variation. Firstly, the termite susceptibility of plastics such as polyvinyl chloride and cellulose acetate increases as the level of plasticizer is increased. Secondly, for those applications in which plasticizing is essential, termite susceptibility can be lessened by the correct choice of plasticizer, i.e. tricresyl phosphate for polyvinyl chloride and dioctyl phthalate for cellulose acetate.

(c) Influence of Physical Factors

In addition to the chemical formulation of a plastic, physical factors such as thickness and surface texture could be expected to influence its susceptibility to termite attack. In Section I reference is made to overseas opinion that thickness is important in this respect, and two series of tests to check this point are summarized in Table 3. In both tests the results show clearly that the susceptibility of polyvinyl chloride is inversely related to thickness—the thinner the film or foil, the greater the amount of attack. This finding has some relevance in view of the increasing use of plastic sheeting

Table 2

Laboratory Iests of effects of variation in plasticizer on termite resistance of plastics

N.e., Nasutitermes exitiosus; C.l., Coptotermes facteus; C.a., Coptotermes acinaciformis; B.S.H., British Standard Hardness; B.S.S., British Standard Softness

Test		No and Tone	196		Amt Enga	
Š.	Details of Sample	of Samples	Sp.		(°°)	Remarks
		Polyvinyl Chloride	٥			
-	Unplasticized, white lead stabilized, 0.1 in. thick sheet	8. Exposed edges	1.0	*	*	No visible arrack
	100 mon (0)	8, Exposed edges		+	+	No visible arrack
	TW parts Cornic DR = 30 dioctyl phthalate = 6 white lead, 0 · 1 in. thick sheet	8, Exposed edges	1.6.	0.14	9.0	Extensive nibbles on edges of all samplas
	IM name Com is no assessment	8, Exposed edges	C.I.	0.25	1.2	Two samples attacked, extensive nibbles to slight attacked.
	To parts Colvic DR - 30 theresyl phosphate +6 white lead, 0.1 in thick sheet			0.03	0.1	Traces of nibbles on edges of some samples only
	100 parts Corvic DR = 30 diocryl phthalate = 7 calcium connect 0.1 in 1813	8, Exposed edges		0.05	0.2	Small isolated patches of nibbles on some samples
	Sheet			0.21	0.85	Extensive nibbles on edges of all samples
	100 parts Corvic DR = 30 trierest phosphage = 2 calcium casses o 1	8, Exposed edges		1.02	4.45	Four samples attacked, 4 with extensive nibbles to slight attack
	thick sheet		.6.	0.10	0.45	Isolated small patches of nibbles on edges of samples
7	100 parts Corvic D65 2-40 dioctvl phthalate (B S H 90) 0:1 in thick show	8. Exposed edges		0.01	90.0	Isolated small patches of nibbles on some samples only
		o, Exposed edges	9.	45.0	3.55	Two samples slightly attacked, 6 with extensive nibbles
	100 parts Corvic D65 2-40 tricresyl phosphate (B.S.H. 96), 0-1 in. thick sheet		; ; ;	0.40	4.00	Five samples attacked, 2 slightly attacked
		o. Exposed edges	•	5 6	4.0	Small patches of nibbles on edges of all samples
	100 parts Corvic D65 2-40 di-isooctyl phthalate (B.S.H. 90), 0-1 in. thick		; ;	70.0	9.0	Extensive nibbles, very obvious on 3 samples
	sheet	o Employed edges		07.0	C4.7	Four samples slightly attacked, 4 with edge nibbles
3	100 parts Corvic D65 2-47-5 dioctyl phthalate (B.S.H. 88), 0-125 in thick	8. Exposed edges	7 7	0.47	4.45	Two samples attacked, 6 slightly attacked
	sheet	o, Exposed edges		76.1	× ×	All 8 samples badly attacked
	100 parts Corvic D65 2-51.8 tricresyl phosphate (B.S.H. 86), 0.125 in.	8. Exposed edges	1)	1.54	15.1	0 14
	thick sheet	0			-	An o samples badly attacked
	100 parts Corvic D65 2 - 47 · S tricresyl phosphate (B.S.H. 94), 0 · 125 in. thick sheet	8, Exposed edges	C.I.	0.52	4.7	Seven samples slightly attacked, 1 with nibbles only
	100 parts Corvic D65 2-43-5 dioctyl phthalate (B.S.H. 94), 0-125 in, thick	8. Exposed edges	()	1.31	9.4.	
	sheet	cagna passadura (c	;	10.	0.+1	All 8 samples attacked to badly attacked
4	PVC, 0-125 in. thick sheet (Corvic D65 8, D.O.P., plasticizer, 47-5 parts:100 base resin) double coated with polyurethane (Daltosec 158)	4, Exposed edges 2, Exposed edges	N.c. C.l.	0.352	1.88	One sample attacked, I slightly attacked on ends, 2 sound One sample slightly attacked (at end), nibbles on 2 (film
						breached)
	As above, but plasticized with D O P 40 parts 100 base assist	4, Exposed edges	C.a.	0.488	2.50	One sample attacked, 3 slightly attacked (film breached)
	The party of the p		.V.e.	0.303	1.77	One sample attacked, 3 slightly attacked (on ends)
		2, Exposed edges	C.1.	0.071	0.79	One sample slightly attacked (at end), nibbles on 1
	As above but planticiand with D to B or or		C.a.	0.483	2.70	Two samples attacked, 2 slightly attacked
	enter the state of	4, Exposed edges	1.6.	0.243	1 - 49	Two samples attacked, I slightly attacked nihhles on I
						(on ends)
		2, Exposed edges	C.1.	0.04	0.50	Nibbles on 2 samples (film breached)
	As above, but plasticized with T C P St. 8 more 100 km.	4, Exposed edges	C.a.	0.651	3.93	Four samples slightly attacked (film breached)
	Control of parts 100 base resin	4, Exposed edges	N. P.	0.261	1 · 30	Three samples slightly attacked, nibbles on 1 (on ends)
		2, Exposed edges	C.I.	0.132	1 - 35	One sample slightly attacked (at end) 1 sample count
		4, Exposed edges	C.a.	0.536	2.76	One sample attacked, 3 slightly attacked

+ No measurable weight loss.

* Small weight loss recorded, but not confirmed by visual appearance of sample.

5	PVC, 0.0625 in. thick sheet, 30 parts plasticizer 100 parts resin. density 1.33.	Exposed edges	1.0.	910.0	0.28	Nibbles on edges of all 6 samples
	B.S.H. at 26 °C 98, B.S.S. at 26 °C 8	8, Exposed edges	C.'.	0.065	0.87	Six samples slightly attacked, extensive nibbles on 2
	As above, 39-5 parts plasticizer 100 parts resin, density 1-30, B.S.H. at	6, Exposed edges	7	0.058	61 - 1	One sample attacked, I slightly attacked, nibbles on 4
	26°C 92, B.S.S. at 26°C 21	8. Exposed edges	C.1.	0.752	11.75	One sample badly attacked, 7 attacked
	As above, 49.5 parts plasticizer 100 parts resin. density 1.28 B.S.H. at	6. Exposed edges	N.e.	0.063	1 - 17	Four samples slightly attacked, nibbles on 2
	26°C 86. B.S.S. at 26°C 27	8, Exposed edges	C.1.	1.285	18 · 70	Four samples badly attacked, 4 attacked
	As above, 59.5 parts plasticizer 100 parts resin, density 1.25, B.S.H. at	6. Exposed edges	N.C.	0.061	1 - 24	One sample attacked, I slightly attacked, nibbles on 4
	26°C 84, B.S.S. at 26°C 33	8, Exposed edges	C.1.	1-475	21.45	Five samples badly attacked, 3 attacked
	As above, 69.5 parts plasticizer 100 parts resin. density 1.23, B.S.H. at	6. Exposed edges	1.0	0.114	2:22	One sample attacked, 3 slightly attacked, nibbles on 2
	26'C 79, B.S.S. at 26'C 36	8. Exposed edges	C.I.	0.840	12.70	Two samples badly attacked, 6 attacked
		Cellulose Acetate				
9	Transparent crystal, dyed, medium acetyl range, medium phthalate range; 0·125 in. diam. rod	8, Uncapped ends	C.I.	1-24	19.85	Four samples destroyed, 4 slightly to badly attacked
	Opaque white, pigmented, medium acetyl range, medium phthalate range; 0·125 in, diam, rod	8. Uncapped ends	C./.	1.09	11 - 85	Three samples destroyed. 5 slightly attacked to attacked
	Translucent cream, pigmented, medium acetyl range, low phthalate range; 0·125 in. diam, rod	8. Uncapped ends	C.I.	0 · 30	4.05	One sample destroyed, 3 slightly attacked to attacked, 4 sound
	Translucent cream, pigmented, high acetyl range, medium phthalate range; 0·125 in, diam, rod	8. Uncapped ends	C.I.	0.61	7 - 30	7:30 Two samples destroyed, 6 slightly attacked to attacked
	Transparent blue, dyed, high acetyl range, medium phthalate range; 0·125 in, diam, rod	8. Uncapped ends	C.7.	0.54	9.55	Two samples destroyed, 6 slightly attacked to attacked
	Transparent brown, dyzd, high acetyl range, low phthalate range; 0-125 in, diam, rod	8, Uncapped ends	C.I.	0.34	4.30	One sample destroyed, 7 showing nibbling to attack
	Translucent brown, pigmented, high acetyl range, low phthalate-phosphate range; 0-125 in, diam, rod	8, Uncapped ends	C.I.	0-25	3.00	One sample destroyed, 6 showing nibbles to slight attack, I sound
	Transparent crystal. dyed. high acetyl range, fow phthalate-phosphate range; 0-125 in. diam. rod	8, Uncapped ends	C.1.	0.17	2.75	One sample destroyed, 4 showing nibbles to slight attack, 3 sound
	Opaque white, pigmented, extra high acetyl range, low phthalate range; 0·125 in. diam. rod	8, Uncapped ends	C.I.	0.15	2.25	One sample destroyed, 2 showing nibbles to slight attack, 5 sound
	dium acetyl range, low phthalate - phosphate range;	8, Uncapped ends C.l.	C.I.	99.0	9.95	Two samples destroyed, 3 slightly attacked to attacked. 3 sound

Laboratory tests of effect of variation in thickness on termite resistance of polyvinyl chloride N.e., Nashtiermes exitiosus; C.l., Coptolermes lacteus TABLE 3

Š Š	Details of Sample	No. and Type of Samples	Sp.	Amt. Eaten (g) (%)	Eaten (%)	Remarks
_	Rigid foil, 0-0012 in. thick	8. Film wrapped around	N.e.		•	Extensive penetration of film and attack on timber cores
		round	C.I.	•	•	Extensive damage to film and attack on timber cores
	Rigid foil, 0·0048 in. thick	8, Hollow rolled tubes	1.0	0.008	0.70	Few nibbles only on edges of 4 samples
-	Rigid foil 0:010 in thick	8. Hollow rolled tubes	C.	80.0	0.70	Numerous areas of slight attack up to & in. from edges
	The state of the s	8. Hollow rolled tubes	N. C.	90.0	0.35	Traces of nibbles on edges of 3 samples
	Rigid foil based on Comits HSC 144. A Age 12. 11.11	8. Hollow rolled tubes	C.1.	90.0	0.30	Few nibbles only on edges of samples
	ASSET TO THE CAPTURE THE SHAPE TO SHAPE THE THICK	3. Hollow rolled tubes	1	+	+	One sample slightly attacked, nibbles on edges of 2
	A subseque 0.01 in a till	3, Hollow rolled tubes	C./.	+	+	One sample slightly attacked, nibbles on edges of ?
	is above, o'o'l m. inck	3. Hollow rolled tubes	N.C.	+	+	Few nibbles on edges of all samples
	As above 0.03 in this	3. Hollow rolled tubes	C.I.	+	+	All samples sound
	ts above, 0.02 in. inick	3. Hollow rolled tubes	N.C.	+	4)	Few nibbles on edges of 2 samples 1 sound
•	by the state of th	3, Hollow rolled tubes	C.I.	+	+	All samples sound
-	betting by the lost of Breon 202 plasticized with D.O.P. and dicyclo- hexyl phthalate: 0.005 in thick	3. Hollow rolled tubes	V.C.	+	+	One sample attacked, I slightly attacked, I with edge
		:				nibbles
-	As above 0.01 in this.	3. Hollow rolled tubes	C./.	4-	+	Two samples attacked, I slightly attacked
-	is acove, 0.01 III. (files	3. Hollow rolled tubes	1.0.	4-	-	Nibbles on edges of all samples
•	As above 0.03 in all in	3. Hollow rolled tubes	C.I.	-}-	+	Nibbles on edges of 2 samples only
	S ACOVE, U. U. III. III.CK	3. Hollow rolled tubes	1.0	+	4-	Nibbles on edges of 1 sample only
		3. Hollow rolled tubes	C.I.	a Ng	+	No visible attack

for damp-proofing, particularly under concrete-slab construction. In order to minimize the risk of termite damage to the plastic membrane, the thickest grade that is economically feasible should be used.

By far the commonest forms in which termites are likely to encounter plastics, however, are piping or cable sheathing. Both these types of product generally present the termites with a surface relatively free from edges or irregularities other than the minor abrasions and scratches sustained during installation. It is not unreasonable to suppose that a curved, unblemished plastic surface offers little opportunity for the initiation of termite attack and that the damage sustained by cables and piping originates from surface imperfections. If this is actually so, then special precautions in processing or installation, or both, to ensure a smooth surface finish on the plastic should minimize termite attack.

This point was checked in a test in which samples of a semi-rigid and a plasticized polyvinyl chloride were given a variety of surface finishes by sanding with different grades of abrasive paper before exposure to termite activity. The results are summarized in Table 4, and it can be seen that none of the treatments had any effect on the termite susceptibility of the finished plastic. It is concluded from this test that the physical nature of the surface of a plastic is of no importance in determining the liability of the plastic to termite attack.

In a series of tests on polyethylene, the effects on termite resistance of other physical factors such as density, molecular weight, and melt flow index* were examined. The results of these tests are summarized in Table 5. The data for Test No. 1 in Table 5 indicate that, if density and the nature of any fillers or additives are kept constant, polyethylene with a high melt flow index is more susceptible to attack than one with a low melt flow index. There is partial confirmation of this finding in Test No. 2, in which the high melt flow index polyethylene without additives is much more susceptible than the low melt flow index material. In the samples containing carbon black, however, the influence of melt flow index is not apparent. In both tests the addition of 10% butyl rubber (polyisobutylene) for the purpose of improving processing qualities adversely affected the termite resistance of the end product.

Test No. 3 (Table 5) clearly demonstrates the greater termite resistance of high molecular weight polyethylene compared to the low molecular weight polymer. In general this is confirmed by the results of Test No. 4 (Table 5). However, the critical molecular weight appears to be around 50,000, and increases beyond this figure produce only very slight improvements in resistance to attack.

In Test No. 5 (Table 5) a group of high-density polyethylenes showed consistently lower levels of attack than a number of low-density polyethylenes. The pattern of attack on the low-density polymers in relation to melt flow index is slightly anomalous; in the *N. exitiosus* tests the more usual pattern of an increased level of attack on high melt flow index material is evident, but in the *C. lacteus* tests the second of the high flow index polyethylenes (density 0.923) proved more resistant than low melt flow index material.

* Melt flow index or melt index is primarily an assessment of the flow properties of the material and is a function of the molecular weight. A low melt index indicates a high molecular weight with maximum toughness and resistance to stress cracking. Conversely, a high melt index indicates a lower molecular weight with improved processing qualities but with reduced toughness and resistance to stress cracking.

LABORATORY TESTS OF EFFECT OF VARIATIONS IN SURFACE FINISH ON TERMITE RESISTANCE OF POLYVINYL CHLORIDE N.e., Nasutitermes exitiosus; C.l., Coptofermes lacteus TABLE 4

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No.	Details of Sample	No. and Type of Samples	Sp.	Test Amt. Eaten Sp. (%)	Amt. Eaten (g) (%)	Remarks
_	Semi-rigid PVC. based on Breon 202, plasticized with D.O.P. and dicyclo- 8, Exposed edges	8. Exposed edges	N.e.	N.e. 0.01	0	Seven samples with a few nibbles on edges
	hexyl phthalate, surface highly polished	8. Exposed edges	C.1.	*		No visible attack
	As above, but surface sanded with fine-grade paper	8, Exposed edges	N.e.	0.02	0.2	Five samples with a few nibbles on edges
		8, Exposed edges	C.I.	•	*	No visible attack
	As above, but surface sanded with medium-grade paper	8. Exposed edges	V. C.	10.0	0 · 1	Five samples with a few nibbles on edges
		8. Exposed edges	C.1.	•	*	No visible attack
	As above, but surface sanded with coarse-grade paper	Exposed edges	1.0	0.05	0.2	Five samples with a few nibbles on edges
r	A CAN LAND AND A CAN LAND A CAN LAND AND A CAN LAND A CAN LAND AND A CAN LAND A CAN LAND A CAN LAND AND A CAN LAND A	Exposed edges	C.I.	*	*	No visible attack
4	Standard PVC, based on Corvic D62 2, plasticized with D.O.P., surface 8, Exposed edges	8. Exposed edges	N.e.	0.08	1.20	Two samples slightly attacked, nibbles on edges of 6
	nigniy polished	8. Exposed edges	C.1.	09:0	8 · 30	Three samples attacked, 4 slightly attacked, 1 with edge
						nibbles
	As above, but sanded with fine-grade paper	Exposed edges	.V. C.	0.10	1.45	One sample slightly attacked, 7 with edge nibbles
		8. Exposed edges	C.I.	0.37	5.25	
	As above, but sanded with medium-grade paper	8, Exposed edges	N. P.	0.14	1.85	
		Exposed edges	C.1.	0.54	7.05	
	As above, but sanded with coarse-grade paper	8. Exposed edges	1.0	0.08	1.15	
		8. Exposed edges	C.I.	92.0	9 · 20	9.50 One sample badly attacked, 5 attacked, 2 slightly attacked

In the last test in this group (No. 6, Table 5), the results show that cross-linked curing of polyethylene is of no value in producing a termite-resistant product.

The general conclusions to be drawn from the above group of tests are that polyethylene varies very widely in its natural resistance to termite attack and the desirable properties for high resistance are a low melt flow index, high density, and high molecular weight.

(d) Incorporation of Insecticides

The tests so far reported in this paper show that some plastics in widespread use, such as plasticized polyvinyl chloride and low-density polyethylene, are liable to severe termite damage. This is confirmed by many field observations and has led to considerable interest in attempting to prevent such damage by the addition of various insecticidal materials during processing. A number of manufacturers have experimented with such additives, mainly of the chlorinated aromatic or cyclodiene type, and Table 6 presents a summary of a series of tests to determine the effectiveness or otherwise of these materials in reducing termite attack.

Figures for the percentages of insecticidal materials present are nominal retentions only, and no information is available on actual retentions. It is not known, therefore, whether any loss of insecticide has occurred during processing but, in view of the thermal instability of some compounds and the high temperatures associated with processing, losses could be expected. For this reason, and also because of variations in the composition of base mixes, no valid comparisons can be made between different tests and each must be considered as a separate entity.

The ratings given in the toxicity column of Table 6 are based on a comparison of the survival times of colonies containing treated samples with those of unfed control colonies. The length of life of the latter measures the normal death rate from starvation, and the number of days by which the life of test colonies falls short of this figure is taken as a measure of the toxicity of materials included in such colonies. The rating "v. slight" indicates that the survival of the colonies concerned was only 1 or 2 days less than that of the unfed colonies, and that toxic action is doubtful.

In Test No. 1 (Table 6) all samples were attacked more heavily by *C. lacteus* than by *N. exitiosus*. Although the level of attack fell as the concentration of "1368" (chlorinated aryl sulphonamide) increased, even at the highest loading tested (2%) complete immunity to attack was not obtained. No untreated control material was available for this test, but untreated polyvinyl chloride of similar composition to the base mix was tested one year previously with the following results: *N. exitiosus*, 0.7g (4.6%) eaten; *C. lacteus*, 0.17g (2.1%) eaten. Even allowing for some variation in the vitality of the termites used in the two separate series of tests, these figures suggest that although the lowest loading of "1368" tested (0.2%) has a deterrent effect on *N. exitiosus* this effect does not occur with *C. lacteus* until a loading of 1% is reached.

Test No. 2 (Table 6) shows that this untreated grade of polyvinyl chloride is slightly susceptible to termite attack, more particularly by C. lacteus. The addition of Xylamon GI (chlorinated naphthalene) lowers this susceptibility progressively with increasing concentration, but even at the highest loading tested (2%) does not give

LABORATORY TESTS OF EFFECTS OF VARIATIONS IN PHYSICAL PROPERTIES ON TERMITE RESISTANCE OF POLYETHYLENE N.e., Nasutitermes exitiosus; C.L., Coptotermes lacteus; C.a., Coptotermes acinaciformis TABLE 5

-	Test	No ord Time	F			
Z.	No. Details of Sample	of Samples	Sp.	Amt. Eaten (g)	Eaten (%)	Remarks
	Polyethylene, melt flow index 0.2, density 0.919,1.2, slip additive (string	8 Evaporad adams		- 1	3	
	0.0625 in. thick)	o Entraca cugas		170-1	9 5	Nibbles on edges of all samples, extensive on 4
	Polvethylene melt flow inday 2.0 decision of the	 Exposed edges 		0.133	5.65	One sample badly attacked, I attacked, 5 slightly attacked
	A. O. C.	Exposed edges	N.e. 0	0.032	0.70	Nibbles on edges of all samples, extensive on 2
	ט יסבט ווו. נחוכא)	Exposed edges	C.L. 0	0.295	05.9	Three campiles hadly attacked A assessing 1 attacked
	Polyethylene, melt flow index 2.0, density 0.931, -2.5% carbon black	8. Exposed edges		0.037	0.80	Clicks associated and americal attacked, I sugnify attacked
	(strips, 0.0625 in. thick)	Company of the control of		5 6	00.0	Sugnit attack on 2 samples, edge nibbles on 6
	dex 0.8 descion 0.014	o. Exposed edges		0.737	2.10	Five samples badly attacked, 2 attacked, 1 slightly attacked
	(effice 0.063%) which	Exposed edges		0.013	0.30	Nibbles on edges of 7 samples, 1 sound
		8. Exposed edges	C.1. 0	0.146	3.05	Four samples attacked A climbth attacked
	Polyethylene, melt flow index 0.3, density 0.932,2.5% carbon black	S Frances advant			0 0	Tour samples and Cheu. 4 Sugnity attacked
	(strips, 0.0625 in. thick)	e, traposed edges		610	65.0	Nibbles on / samples, I sound
	į	8, Exposed edges		0.185	3.45	Four samples attacked, 4 slightly attacked
	Conjugation, inter flow illness 2.0, density 0.930, - 10% butyl rubber	Exposed edges	.N.e. 0	0.075	1.65	Attack on I sample, slight attack on 3 milbles on 4
•	(strips, 0.00-3 in. thick)	8, Exposed edges	CL = 0	0.333	7.25	Five complete hadly agreemed 2 perceived
•	2 Polyethylene sheet 0.0625 in. thick, melt flow index 2.0, base polymer	8. Exposed edges		0.0.0	0.70	Slight attack on 3 commune
	density 0.92 - 2% carbon black and 10% butyl rubber (D11 32)	8. Masked edges			*	Me which is the samples, modes on o
		0		;		I'V VISIDIE ALLACK
				0.415	9.50	One sample badly attacked, 4 attacked, 3 slightly attacked
		Masked edges	C.l. 0	0.041	0.95	Nibbles on faces and edges of 5 samples
	rotyetnylene sneet 0.0623 in. thick, melt flow index 2.0, base polymer	Exposed edges	N.e. 0	0.021	0.40	Slight attack on I sample nibbles on 7
	density 0.92, -72% carbon black (B11.04)	8. Masked edges	N. C.	*	*	No visible attack
		8. Exposed edges		0.240	4.70	One comple attacked California and a man
					2 6	One sample attached, 6 slightly attacked, hibbles on 1
	Polyethylene sheet 0.0625 in thick melt flow index 0.3 have notional			410.	05.0	Nibbles on edges and faces of 2 samples
				0.011	81.0	Nibbles on edges of 8 samples
	The state of the s			*	*	No visible attack
			C.1. 0	0.278	3.20	Seven samples slightly attacked, pibbles on 1
		Masked edges	C.1. 0	0.022	0.40	Nibbles on faces of 8 samples
	rolyethylene sheet 0.0625 in, thick, melt flow index 0.3, base polymer	Exposed edges	N.e. 0	0.004	0.13	Nibbles on edges of 8 samples
	density 0.92 (DFDL 6005)	Masked edges	N.C.		*	No visible attack
		8. Exposed edges	C.1. 0	0.133	3.45	Three samples attacked & clickely accorded
		8. Masked edges	0 10	0.016	0.50	Nithing to Commerce, Sanganay anached
	Polyethylene sheet 0.0625 in. thick, melt flow index 2.0, base polymer				00.00	Inibutes on faces of 7 samples
	density 0.92 (DFDL 2005)	8 Machad adam			<u>.</u>	inipoles on edges of 8 samples
				. ;	, ;	No visible attack
		o, Exposed edges		0.247	4.20	One sample attacked, 6 slightly attacked, nibbles on 1
۳,				0.037	0.65	Nibbles on faces of 5 samples
,	Forgrangiant since of ourselling filler, mon. Wt. 42,(Not. density 0.922 (XDG 33)	Exposed edges	N.e. 0.	600.0	0.14	Nibbles on edges of all 8 samples
		8. Masked edges	N.C.			No visible attack
		8. Exposed edges	C.a. 0.	0.305	4 - 75	Two samples attacked 6 cliabily attached
		8. Masked edges	C.a.		*	No visible attack
	As above, mol. wt. 24,000, density 0.922 (XRM 21)		N.e. 0.	0.042	0.77	Extensive nibbles on edges of all 8 summing
		8. Masked edges	N.C.		*	No visible attack
		8. Exposed edges	0 0	0.711	13.30	Figure commenter handle, assembled 2 and 1
		Masked edges			00.0	rave samples badiy attacked, 2 attacked, 1 slightly attacked
						intopies on surface of 1 sample

•		C.1.	910.0	0.07	Extensive nibbles on ends of both samples
7		C.a.	880.0	0.49	Slight attack on ends of both samples
As above (GC 6465, white Hostalen, mol. wt 50,000)	8. Strips	1.0	0.021	0.35	Nibbles on edges of all 8 samples
	(exposed edges)				
	2. Pipe (uncapped)	C.1.	0.054	0.25	Slight attack on end of 1 sample, nibbles on remaining ends
	Pipe (uncapped)	C.a.	0 · 101	0.67	Slight attack on ends of 1 sample, nibbles on ends of 1
As above (GF 5250, white Hostalen, mol. wt. in 50,000-300.000 range) 8.	Strips	N.C.	0.022	0.30	Nibbles on edges of all 8 samples
As above (GF 5250, black Hostalen, mol. wt. in 50,000–300,000 range) 8,		N.C.	0.011	91.0	Nibbles on edges of all 8 samples
	(exposed edges)	,		ò	
300 000 000 000 000	2. Prpe (uncapped)	; ;	0.014	9 6	Extensive nibbles on both ends of 2 samples
As above (GF 3730, white Hostalen, moi. Wt. in 30,000–300,000 range) 8		N.C.	0.019	0.78	Nibbles on edges of all 8 samples
	(exposed edges)	1)	0.043	01.0	Climbe attended on one and of the second of
			1	2 6	Sugar attack on one chaot i sample, moores on remaining er
As above (GF 5750, black Hostalen, mol. wt. in 50,000-300,000 range) 8	2. ripe (uncapped) 8. Strins		0-007	0.12	Night attack on ends of 1 sample, montes on ends of 1
	(exposed edges)			!	
61	2. Pipe (uncapped)	C.L	0.034	0.15	Slight attack on one end of I sample, nibbles on remaining ends
As above (GM 5010, black Hostalen, mol. wt. c. 300,000)	8, Strips		0.012		Nibbles on edges of all 8 samples
	(exposed edges)				
As above (GM 5050, white Hostalen, mol. wt. c. 300,000)	2. Pipe (uncapped)	C.I.	0.033	0.15	Slight attack on one end of 1 sample, nibbles on remaining ends
	2. Pipe (uncapped)	C.a.	900.0	0.04	Nibbles on both ends of 2 samples
Polyethylene sheet 0.0625 in. thick, high density, 0.95 (Bakelite DGD 4100 6			900.0	0.18	Nibbles on all 6 samples
	8, Exposed edges	C.	990.0	1.40	Five samples slightly attacked, nibbles on 3
As above, high density, 0.95 (Marlex XBP3-73 Natural)	6, Exposed edges	N. P.	0.008	0.25	Nibbles on all 6 samples
	8, Exposed edges	C.I.	0.069	1.65	Seven samples slightly attacked, extensive nibbles on 1
As above, high density, 0.95 (Marlex TR201 Natural)		N.e.	0.004	0.12	Nibbles on all 6 samples (slight on 3)
	8. Exposed edges	C.	0.048	0.95	Four samples slightly attacked, nibbles on 4 (extensive on 2)
As above, high density, 0.95 (Rigidex Type 3 Natural)		N.e.	0.005	0.07	Traces of nibbles on all 6 samples
		C.	0.061	1.35	Seven samples slightly attacked, nibbles on 1
As above, high density, 0.95 (Rigidex Type 3 Black)		. v.	0.00	0.15	Nibbles on 3 samples
So to the contract of the second contract of			0.0/0	3 5	Eight samples slightly attacked
	o. Exposed edges	, .e.	010.0	07.0	Niobies on all 6 samples
As above low density 0.919 melt flow index 2.0		, ×	0.016	38.0	Nithblee on all 6 camples
		C	0.181	3.20	Five samples attacked, 2 slightly attacked, nibbles on 1
As above, low density, 0.923, melt flow index 2.0	6, Exposed edges	N.P.	0.015		Nibbles on all 6 samples
	8. Exposed edges	C.I.	0.100		Seven samples slightly attacked, nibbles on f
As above, low density, 0.927, melt flow index 0.5	6. Exposed edges	N.e.	0.011	0.27	Nibbles on all 6 samples
	8. Exposed edges	C.	0.160	2.96	Seven samples slightly attacked, nibbles on 1
e insulation, cross-linked with di-cumyl peroxide		N.e.	0.010	0.02	Few nibbles, only on edges
(approx. 0·125 in. thick)		N.e.	•	•	No visible attack
		C.7.	0.030		Slight attack on 2 samples, nibbles on edges of 6 (on faces of 3)
		C.	0.025		Nibbles on faces of 8 samples
	8. Exposed edges	C.a.	0.26	2.10	Slight attack on 8 samples
	֡				

No measurable weight loss.

Table 6 LABORATORY TESTS OF EFFECT OF VARIOUS ADDITIVES ON TERMITE RESISTANCE OF PLASTICS N.e., Nasutitermes exitiosus; C.l., Coptotermes lacteus; C.a., Coptotermes acinaciformis

S.	Details of Sample	No. and Type of Samples	Test Sp.	Amt.	Amt. Eaten (g) (%)	Toxicity	Remarks
		Polyvi	Polyvinyl Chloride	oride			
_	Corvic D65 2, white lead stabilized, D.O.P. plasticized - 0.2% termite repellant 1368 (chlorinated aryl sulphonamide) 0.0625 in, thick	8. Exposed edges 8. Exposed edges	N.e. C.l.	0.20	1.6	V. slight None	Extensive nibbles on edges of all samples Extensive nibbles on edges of all samples
	As above - 0.5% termite repellant 1368	8. Exposed edges	N.O.	91.0	1.2	V slioht	Extensive nibbles on advas of all commission
		8. Exposed edges	CL	0.41	56.1	None None	Nithbles on edges and faces of all samples
	As above - 1°, termite repellant 1368	8. Exposed edges	V.c.	0.11	6.0	V. slight	Nibbles on edges of all samples
			C.1.	61.0	1.55	V. slight	Nibbles on edges and faces of all samples
	As above - 2% termite repellant 1368	8. Exposed edges	N.e.	0.09	1.0	V. slight	Patches of nibbles on edges of all samples
-			C.I.	0.11	6.0	Slight	Occasional nibbles, mainly on edges of samples
-1	Corvic Dob 8, D.O.P. plasticized, untreated (0.5 in. thick)		N.c.	0.24	0.4	Slight	Patches of nibbles on edges of all samples
	As above - 0.30 Xvlamon Gl (chlorians d marketerior		C.1.	0.77	1.2	None	Slight attack on edges and faces of all samples
		o, Exposed edges	N.C.	0.13	0.3	Slight	Small patches of nibbles on edges of all samples
	As above = 0.5°, Xvlamon GI	6. Exposed edges		0.25	0.4	V. slight	Slight attack on all samples, mainly from edges
			. · ·	1 0	2.0	Slight	Small patches of rubbles on edges of all samples
	As above - 1% Xylamon GI	6. Exposed edges	, ×	0.13		Slight	Extensive nipples or slight attack on all samples
		6. Exposed edges	C./	0.12	0.3	Slight	Small areas of nibbles mainly on edges of complex
	As above - 2% Xylamon GI	6. Exposed edges	N.e.	0.14	0.3	Slight	Few nibbles on edges of all samples
		6, Exposed edges	C.1.	0.11	0.3	Medium	Few small areas of nibbles, mainly on edges of samples
2	Cable sheathing, untreated (0.125 in. diam.)	8. Wax-sealed ends	N.e.	*	*	Slight	Three samples with conductor exposed, 1 with nibbles,
							4 sound
	· · · · · · · · · · · · · · · · · · ·	8. Wax-sealed ends		*	*	None	Three samples with nibbles, 5 sound
	As above - 0.1% dieldrin	8. Wax-sealed ends		*	*	Slight	Two samples with conductor exposed, 1 with nibbles, 5 sound
		8. Wax-sealed ends		*	•	None	One sample with nibbles, 7 sound
	As above - 0.23% dielarin	8. Wax-sealed ends		*	*	Slight	One sample with conductor exposed, 1 with nibbles, 6 sound
	As observed to the state of the	8. Wax-sealed ends		*	•	None	One sample with nibbles, 7 sound
	and the second s	8. Wax-sealed ends		*	*	Medium	One sample with nibbles. 7 sound
	As shows 10 disher	8. Wax-sealed ends		•	*	V. slight	One sample with nibbles, 7 sound
	and the dielerin	8. Wax-sealed ends		*	•	Medium	One sample with nibbles, 7 sound
		8. Wax-sealed ends		•	*	V. slight	All samples sound
	As above - 2.0 dieldrin	8, Wax-sealed ends		*	*	High	All samples sound
		8. Wax-sealed ends		*	*	High	All samples sound
	As above - 3% dieldrin	8. Wax-sealed ends		*	*	High	All samples sound
		8. Wax-sealed ends		*	•	High	All samples sound
	As above 4, dieldrin	8. Wav-sealed ends		•	•	High	All samples sound
	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	8. Wax-sealed ends		•	•	High	All samples sound
	above to a dictarin	8. Wax-sealed ends		*	•	High	All samples sound
		8 Wax-sealed ends	1		•	Link	A 11

TAC CADIC SIRAIII - O - O GIGIOTIII (O -) III. GIGIII.)	8, wax-sealed ends		•	•	V. slight	No visible attack
	8, Wax-sealed ends	C.I.	*	•	Slight	No visible attack
PVC cable sheath -0.31° , aldrin (0.25 in, diam.)	8. Wax-sealed ends	N.e.	•	•	Medium	No visible attack
	8. Wax-sealed ends	C.I.	*	*	High	No visible attack
PVC cable sheath = 1°, DDT (0.25 in, diam.)	8. Wax-sealed ends	N.C.	•	•	None	No visible attack
	8. Wax-sealed ends	C./.	0.25	0.75	None	Two samples with conductor exposed, 4 with nibbles, 2 sound
DVC cable sheath = 1% arsenious oxide (0:25 in. diam.)	8. Wax-sealed ends	N	80.0	0.24	None	Two samples with small areas of nibbles
	8. Wax-sealed ends	0.1.	0.20	0.63	None	Five samples with conductor exposed, 3 with nibbles only
S Corvic D65 2 film 0.04 in thick untreated	8. Film wrapped	N. P.	*	*	Slight	Up to 20% of film destroyed
	around timber					
	samples	C.I.	•	•	Medium	Film penetrated in several places
As above - 0.5% aldrin	8. Film wrapped	N.e.	*	•	High	Less than 1% of film destroyed
	around timber					
	samples	C.I.	*	*	High	Film penetrated in several places
6A PVC. white-lead stabilized and dioctyl phthalate-plasticized,	8. Exposed edges	N.e.	0.37	4.6	None	Extensive nibbles on edges of all samples
untreated and unaged (0.0625 in. sheet)	8. Exposed edges	C.1.	0.17	2.1	None	Patches of nibbles along edges of all samples
As above - 0.2% dieldrin	8. Exposed edges	N.e	0.01	0.5	Medium	Small patches of nibbles on edges of samples
	8, Exposed edges	C.I.	0.03	0.4	None	Nibbles on edges of 7 samples, 1 sound
As above - 0.2% aldrin	8. Exposed edges	N.e.	90.0	0.7	Medium	Three samples with edge nibbles, 5 sound
	8. Exposed edges	C.1.	*	*	High	Seven samples with few edge nibbles, I sound
As above - 2 % Nibren Wax (chlorinated naphthalene)	8, Exposed edges	N.e.	0.20	2.0	V. slight	Extensive nibbles on edges of all samples
	8. Exposed edges	C.I.	0.13	1.2	None	Extensive nibbles on edges of all samples
As above - 0.2% lindane	8. Exposed edges	N.e.	0.02	9.0	None	Nibbles on edges of all samples
	8. Exposed edges	C.I.	0.04	0.5	None	Patches of nibbles on edges of all samples
As above - 0.2% Z.A.C. (dimethyl dithiocarbamate-cyclohexy-	8, Exposed edges	N.e.	91.0	2.0	None	Extensive nibbles on edges of all samples
lamine complex)	8, Exposed edges	C.I.	0.01	0.5	None	Patches of nibbles on edges of all samples
As above - 2% See Kay Wax (chlorinated naphthalene)	8. Exposed edges	N.e.	0.12	1.3	Slight	Extensive nibbles on edges of all samples
	8. Exposed edges	C.1.	0.02	9.0	None	Nibbles on edges of all samples
6B PVC, white-lead stabilized, dioctyl phthalate-plasticized, un-	4. Exposed edges	N.e.	0.31	2.7	?V. slight	•
treated, artificially aged (0.0625 in. sheet)	4. Exposed edges	C.I.	0.44	- · 8	None	
As above - 0.2% dieldrin	4. Exposed edges	N. P.	80.0	1.3	?V. slight	
	4. Exposed edges	C.I.	0.02	8.0	None	Edge nibbles, isolated small areas of slight attack
As above - 0.2% aldrin	4. Exposed edges	N.e.	0.09	1.6	None	Edge nibbles, isolated small areas of slight attack
	4. Exposed edges	C.I.	0.08	1.2	None	
As above - 2% Nibren Wax	4. Exposed edges	N.C.	0.28	4.3	?V. slight	-
	Exposed edges	C.I.	0.50	7.4	None	All samples slightly attacked to attacked
As above — 0.2% lindane	4. Exposed edges	N.e.	0.29	5.1	None	All samples slightly attacked to attacked
	4. Exposed edges	C.7.	0.41	8.9	None	
As above - 0.2% Z.A.C.	4. Exposed edges	N.e.	0.29	9.9	?V. slight	All samples slightly attacked to attacked
	4. Exposed edges	C.I.	0.48	0.6	None	All samples slightly attacked to attacked
As above - 2% See Kay Wax	4. Exposed edges	N.e.	0.27	4.0	None	All samples slightly attacked to attacked
	4, Exposed edges	C.I.	0.42	6.2	None	All samples slightly attacked to attacked
7 Corvic D65/2 plasticized with D.O.P., untreated (0.0625 in.	32, Exposed edges	N.e.	0.10	1 . 4	None	Damage ranging from extensive nibbles to slight attack
sheet), four types of surface finish	32. Exposed edges	C.1.	0.57	7.5	None	Damage ranging from slightly to badly attacked
As above - 0.2% dieldrin, four types of surface finish	32. Exposed edges	N.e.	0.04	0.5	None	Nibbles only along edges of samples

TABLE 6 (Continued)

Test	Descile of Court	No. and Type		Test An	Amt. Eaten		
ģ	1	of Samples			(%)	Toxicity	Remarks
			Polystyrene	rene			
00	Expanded polystyrene, untreated (1.5 in. thick)	24, Exposed edges N.e.	S. N.	٠.	*	None	Most samples slightly attacked
		24, Exposed edges	es C.I.	*	*	None	All samples badly attacked or destroyed
	As above $+1\%$ dieldrin	24, Exposed edges	es N.e.	e. •	*	V. slight	
		24, Exposed edges	es C.I.	* 7	•	None	
			Polyethylene	ylene			
6	Grade 20, cable sheath. untreated	8, Uncapped	N.e.	e. 0.02	2 0.06	None	Small isolated areas of attack on 3 samples
		8, Uncapped	C.1.	• 7	•	None	Few small areas of attack only
		8, Uncapped	C.a.	a. 0.69	3.1	None	Penetration to conductor in all samples
	As above + lead naphthenate	8, Uncapped	N.e.		•	None	No visible attack
		8, Uncapped	C.7.	•	*	None	Isolated areas of surface nibbles
		ထ်				None	Penetration to conductor in all samples
2	Sheet, 0.0625 in. thick (DFDL-6015 0.3 melt index, 0.92	တ်	es N.e.	. 0.011	1 0.18	None	Nibbles on edges of 8 samples
	density base resin -2.5% carbon black)	8, Masked edges	.s. N.e.		•	None	No visible attack
		8, Exposed edges	es C.I.	. 0.230	30 3.10	V. slight	Slight attack on all samples from edges
		8, Masked edges	s C.I.	. 0.141	11 1.30		Nibbles on faces (and edges) of all samples
		4, Exposed edges	es C.a.	a, 0.382	32 10 30		Attack on I sample, slight attack on 3
		4, Masked edges	s C.a.	7. 0.156	3.14	4 None	Slight attack on I sample, nibbles on 2
	As above = 0.2% Sevin	4, Exposed edges	es N.e.	*	•	None	Few nibbles on edges of 2 samples
		4, Masked edges	S N.e.	•	*	None	No visible attack
		8, Exposed edges			31 1-15	5 Slight	Slight attack on edges of 5 samples, nibbles on 3
		8, Masked edges	s C.I.	. 0.045		5 Slight	Slight attack on end of I sample, 7 sound
		4, Exposed edges	es C.a.	2. 0.180	30 5.01	 V. slight 	Slight attack on 6 samples
	A	4, Masked edges		ı. •	*	V. slight	No visible attack
	As above - 0.5% Sevin	4, Exposed edges	es N.e.	•	•	None	Few nibbles on edges of 1 sample
		4, Masked edges		•	•	None	No visible attack
		8, Exposed edges		Ó	16 0.25		Nibbles on edges of 6 samples
		8, Masked edges			*	Slight	No visible attack
		4, Exposed edges		z. 0.035	15 1.00	0 Slight	Slight attack on 2 samples, nibbles on 2
		4. Masked edges		*	•	Siight	No visible attack
	As above + 1% Sevin	4. Exposed edges		*	•	None	Few nibbles on edge of 1 sample
		4. Masked edges	s N.e.	*	*	None	No visible attack
		8, Exposed edges	es C.I.	. 0.013	3 0.20	0 Slight	Nibbles on edges of 7 samples
		8, Masked edges	s C.I.		•	V. slight	No visible attack
		4, Exposed edges	es C.a.	7. 0.012	2 0.27	7 Medium	Nibbles on edges of all samples
		4. Masked edges	s C.a.	•	•	Medium	No visible attack
=	Pipe, I in. I.D., untreated	2, Uncapped ends	ids C.a.			9 Slight	Slight attack on ends of samples
		2, Capped ends	C.a.	, 0.02	0-12	2 Slight	Two patches of nibbles on pipe walls
	As above + 1% Sevin	2. Uncapped ends		*	*	Medium	No visible attack
		2, Capped ends	C.a.	*	*	Medium	No visible attack

17	Pipe. 0.75-in. bore. 0.060-in. wall thickness. (Alkathene	S	910.0	0.15	None	Nibbles on end of I sample
	D140 21 black 902, melt flow index 0.25, density 0.934)	2 Capped ends N.e.	•	•	None	No visible attack
		2, Uncapped ends C.I.	0.028	0.30	None	Nibbles on both ends of 2 samples
		2, Capped ends C.l.	•	*	None	No visible attack
		2, Uncapped ends C.a.	0.225	2.60	None	Attack on ends of 2 samples (holes through walls of both)
		2, Capped ends C.a.	0.092	1.05		Attack on walls of 2 samples (extensive)
	As above - 0.05% lindane	2. Uncapped ends N.e.	*	•	None	No visible attack
		2. Capped ends N.e.	•	*	None	No visible attack
		2. Uncapped ends C.I.	0.010	0.10	None	Nibbles on end of I sample
		2. Capped ends C.I.	•	•	None	No visible attack
		2, Uncapped ends C.a.	0.018	0.20	None	Few nibbles on ends of 2 samples
		2, Capped ends C.a.	•	•	None	No visible attack
	As above - 0.1% lindane	2, Uncapped ends .N.e.	*	*	None	No visible attack
		2, Capped ends N.e.	*	*	None	No visible attack
		2, Uncapped ends C.I.	0.021	0.25	None	Nibbles on ends of 2 samples
		2, Capped ends C.I.	•	•	None	No visible attack
		2, Uncapped ends C.a.	0.018	0.20	None	Few nibbles on ends of 2 samples
		2, Capped ends C.a.	•	*	None	No visible attack
	As above + 0.2% lindane	2, Uncapped ends N.e.	*	*	None	No visible attack
		2, Capped ends N.e.	*	*	None	No visible attack
		2, Uncapped ends C.I.	0.024	0 · 30	None	Nibbles on ends of 2 samples
		2, Capped ends C.I.	*	*	None	No visible attack
		2, Uncapped ends C.a.	0.022	0.30	None	Nibbles on ends of I sample only
		2, Capped ends C.a.	*	*	None	No visible attack
	As above + 0.05% Gammexane	2, Uncapped ends N.e.	*	*	None	No visible attack
		2, Capped ends N.e.		*	None	No visible attack
		ş	Ó	0.25		Nibbles on ends of 2 samples
		2, Capped ends C.I.		*	None	No visible attack
		2, Uncapped ends C.a.	Ó	0.70		Attack on end of I sample, pipe wall holed in I sample
		2, Capped ends C.a.		•	None	No visible attack
	As above - 0.1% Gammexane	ls.	Ò	0 · 10	None	Nibbles on end of 1 sample
				•	None	No visible attack
		2. Uncapped ends C.I.	Ö	0.35	None	Slight attack on end of 1 sample, nibbles on 1
		Capped ends C.I.		*	None	No visible attack
		2, Uncapped ends C.a.	0.052	0.00	None	Attack on end of I sample, slight attack on end of I
		2, Capped ends C.a.	•	*	None	No visible attack
	As above - 0.2% Gammexane	2, Uncapped ends N.e.	•	*	None	No visible attack
				•	None	No visible attack
		qs	0	0.20	None	Nibbles on ends of 2 samples
		2, Capped ends C.I.		*	None	No visible attack
		ds	0.024	0.30	None	Nibbles on ends of 2 samples
		2, Capped ends C.a.	*	•	None	No visible attack

TABLE 6 (Continued)

ř	153	. V	Ė	1			
Z	No. Details of Sample	of Samples	Sp.	(g)	(g) (%)	LOXICITY	Remarks
		Pol	Polyurethane	ıe			
_	13 Sheet, 0.5 in. thick (polyester-prepolymer-based foam, 2-3	8. Exposed edges	N.e.	0.105	4.75	Medium	Eight samples attacked
	lb cu ft density), untreated	8. Exposed edges		0.350	16.55	Medium	Six samples badly attacked, 2 attacked
	As above - 1°, chlordane by weight	8. Exposed edges	N.e.	0.113	4.80	Medium	Two samples badly attacked, 4 attacked, 2 slightly attacked
			C.I.	0.190	7.95	Medium	Six samples attacked, 2 slightly attacked
	As above - 0.5% dieldrin by weight			0.092	3-75	Medium	Four samples badly attacked, 2 attacked, 2 slightly attacked
				0.212	8 - 85	Medium	Six samples attacked, 2 slightly attacked
	As above - 0.5% aldrin by weight			0.117	5.35	Medium	Four samples attacked, 4 slightly attacked
		8. Exposed edges		0.135	6.25	Medium	Two samples attacked, 6 slightly attacked
	As above 0.06", arsenic pentoxide by weight			0.125	2.00	Medium	Six samples attacked, 2 slightly attacked
				0.158	6.45	High	Six samples slightly attacked, 2 attacked
	As above - 1.0% phenyl mercuric complex by weight	8, Exposed edges		0.158	6.45	Medium	Eight samples attacked
				0.270	12.90	Medium	Two samples badly attacked, 4 attacked. 2 slightly attacked
	As above - 2.5% phenyl mercuric complex by weight			0.250	10.85	Medium	Eight samples attacked
,		8, Exposed edges		0-403	16.95	Medium	Four samples badly attacked, 4 attacked
_	14 Foam (polyester-prepolymer-based, 2-3 lb cu ft density)			0.505	26.60	Slight	Seven samples badly attacked, 1 attacked
	0 · 5-insquare strips, untreated	8, Exposed edges		0.557	28 · 30	Medium	Eight samples attacked
		8, Exposed edges		0.847	43.60	Medium	Eight samples badly attacked
	As above - 0.5%, aldrin by weight			0.427	20.45	Slight	One sample badly attacked, 2 attacked, 5 slightly attacked
		8, Exposed edges	C.I.	0.736	40.50	Medium	Eight samples badly attacked
		8, Exposed edges		0.891	35.00	Medium	Three samples badly attacked, 5 attacked
	As above - 1.0% aldrin by weight	Exposed edges		0.291	17 - 15	Slight	Eight samples attacked
		8, Exposed edges		0.610	27.90	Medium	One sample badly attacked, 7 attacked
				0.815	35.10	Medium	Six samples badly attacked, 2 attacked
	As above - 3.0% aidrin by weight			0.321	16.00	Slight	Seven samples attacked, I slightly attacked
		8. Exposed edges	C:1	0.361	17-15	Medium	Eight samples slightly attacked
				0.410	18.20	Medium	Three samples attacked, 5 slightly attacked
	As above ~ 0.5% dieldrin by weight			0.483	28 · 10	Slight	Seven samples badly attacked, 1 attacked
				0 · 700	37 - 70	Medium	Eight samples attacked to badly attacked
		8. Exposed edges	C.a.	0.717	37.80	Medium	Five samples badly attacked, 3 attacked
	As above - 1.0 % dieldrin by weight	8. Exposed edges		0.453	26.30	Slight	Seven samples badly attacked, I attacked
		8. Exposed edges	C./.	$869 \cdot 0$	40.65	Medium	Eight samples attacked to badly attacked
		8. Exposed edges	C.a.	0.712	38 · 15	Medium	Six samples badly attacked, 2 attacked
	As above 5.0% dieldrin by weight	8. Exposed edges		0.384	19.40	Slight	Two samples badly attacked, 6 attacked
		8. Exposed edges	C.I.	0.441	20.00	Medium	Three samples attacked, 5 slightly attacked
		8. Exposed edges	C.a.	0.793	32.85	Medium	One sample badly attacked, 4 attacked, 3 slightly attacked

15 Elastomer, hand cast 0.5-in, sheet, untreated	8, Exposed edges N.e. 0.140 0.15 None	1.0	0.140	0.15	None	Nibbles on 8 samples
	8, Exposed edges C.l. 0.101	C.1.	0 · 101	0.12	None	Slight attack on 5 samples, nibbles on 3
	8. Exposed edges C.a.	C.a.	0.267	0.35	None	Slight attack on 6 samples, nibbles on 2
As above 1°, chlordane by weight	8. Exposed edges	1.6.	•	*	High	A few nibbles on 1 sample
	8, Exposed edges	C.1.	•	•	High	No visible attack
	8. Exposed edges C.a.	C.a.	•	*	High	No visible attack
As above - 0.25% dieldrin by weight	8. Exposed edges N.e.	N.e.		•	Medium	No visible attack
	8. Exposed edges	C.I.	*	*	Medium	No visible attack
	8. Exposed edges	C.a.	•	*	Medium	No visible attack
As above - 0.06% arsenic pentoxide by weight	8. Exposed edges N.e. 0.213	N.e.	0.213	0.27	0.27 None	Nibbles on edges of 8 samples
	8. Exposed edges C.l. 0.245	C.I.	0.245	0.33	0-33 None	Slight attack on 4 samples, nibbles on 4
	8. Exposed edges C.a. 0.346 0.46 None	C.a.	0.346	0.46	None	Slight attack on 7 samples, nibbles on 1

* No measurable weight loss.

complete protection. No toxic action toward *N. exitiosus* could be demonstrated, but *C. lacteus* is affected progressively as the concentration of Xylamon GI rises.

In Test No. 3 (Table 6) this formulation of polyvinyl chloride is somewhat more susceptible to N. exitiosus than C. lacteus in the untreated condition. The addition of dieldrin reduces susceptibility to attack progressively with increasing concentration up to the $2\frac{9}{6}$ level, at which complete protection is obtained. In the same way, toxicity to both species of termites increases up to the $2\frac{9}{6}$ level, beyond which no added activity occurs.

The polyvinyl chloride cable sheaths in Test No. 4 (Table 6) were supplied by three different manufacturers, so there may well be intrinsic differences in the natural resistance of the base mixes. Sheaths containing 0.2% dieldrin, 0.31% aldrin, or 1% DDT are immune to attack by *N. exitiosus*, but only the first two of these treatments are effective against *C. lacteus*. Both the dieldrin and aldrin treatments are obviously toxic to the two species of termites.

In Test No. 5 (Table 6) polyvinyl chloride film shows definite evidence of improved resistance to attack by N. exitiosus after the incorporation of 0.5% aldrin. There is no appreciable improvement in its resistance to C. lacteus attack, but the treated film is considerably more toxic to both termites.

Test No. 6 (Table 6) consists of two parts, A and B, the first of which was made with samples recently processed and the second with samples subjected to an artificial ageing process. This process consisted essentially of exposing the samples to a constant-speed air stream at 82±1°C, for a period of 6 weeks.

In the tests of unaged polyvinyl chloride, all the treated samples have a higher termite resistance than the untreated material, the 0.2% aldrin, dieldrin, and lindane treatments being somewhat superior to the others.

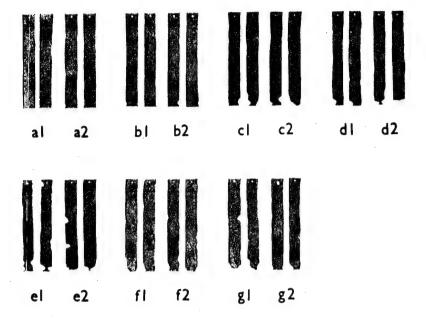
After artificial ageing, the only treatments that are obviously better than the untreated controls are 0.2% aldrin and 0.2% dieldrin, both of which continue to give a high level of protection (Fig. 4). The effectiveness of the remaining four treatments has been destroyed by the accelerated ageing process.

In Test No. 7 (Table 6) the weight loss figures represent the average values of eight separate readings (duplicate tests of four different surface finishes) for both untreated and treated material. The addition of 0.2% dieldrin to polyvinyl chloride reduces the amount of termite attack, especially that of *C. lacteus*, but does not give complete immunity. In this test, as in the previous one, there is no indication of toxic action resulting from the addition of dieldrin.

In Test No. 8 (Table 6) the results are a summary of six readings on both untreated and dieldrin-treated expanded polystyrene. The cellular and friable nature of this material made it impossible to remove all termite plastering effectively, so that no reliable weight loss figures could be obtained although all samples showed obvious damage. The untreated material is susceptible to termite attack, especially by C. lacteus, but the addition of 1% by weight of dieldrin decreases this susceptibility appreciably. There is very little evidence of toxic action, however, and this, together with the failure of the treatment to give anything approaching complete protection, strongly suggests that the actual retention of dieldrin is very much less than the stated figure of 1% by weight.

Several tests were made with insecticidal additives to polyethylene. In Test No. 9 (Table 6), polyethylene cable sheath, untreated and treated with an unspecified amount

Nasutitermes exitiosus



Coptotermes lacteus

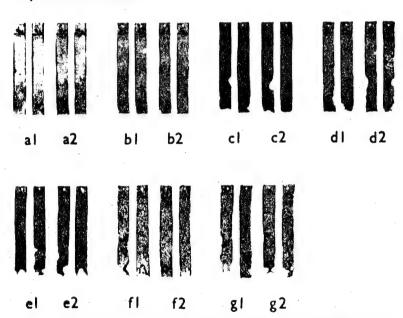


Fig. 4. Samples of polyvinyl chloride containing various insecticides tested for termite resistance after artificial ageing. (a1, a2) 0·2% dieldrin; (b1, b2) 0·2% aldrin; (c1, c2) 2·0% Nibren Wax; (d1, d2) 0·2% lindane; (e1, e2) 0·2% Z.A.C.; (f1, f2) 2·0% See Kay Wax; (g1, g2) untreated.

of lead naphthenate, was subjected to the attack of three different species of termites. The results obtained with *N. exitiosus* and *C. lacteus* are inconclusive, but the *C. acinaciformis* test shows very clearly that this termite is quite unaffected by the addition of lead naphthenate.

The effect of increasing additions of Sevin (1-naphthyl N-methyl carbamate) to low-density polyethylene is shown in Test No. 10 (Table 6). There is a progressive reduction in attack as the level of Sevin rises, and this is particularly evident in the C. acinaciformis colonies in which the level of attack drops from about 10% for fully exposed untreated samples to about 0.25% for similar samples containing 0.5% Sevin. A further point of interest is that the treatment exhibits only a slight to medium toxic effect on Coptotermes spp., and none at all on N. exitiosus.

In a further test of Sevin (Test No. 11, Table 6) the results confirm the effectiveness of a 1% addition in producing immunity to termite attack.

Test No. 12 (Table 6) gives details of the effects of progressive additions of lindane and Gammexane on the termite resistance of a medium-density polyethylene. It may be seen that the untreated polymer is most severely damaged by C. acinaciformis, and that the damage is effectively reduced by all levels of lindane, and by the highest level of Gammexane (0.2%). The last fact infers that protection is related to the content of γ -isomer, in this case about 0.025%, and that this is the minimum loading that can be expected to give a high level of protection. It should be noted that none of the treatments was toxic to any of the three species of termites, and this suggests that the protective action is due to repellent or deterrent properties. Such properties are frequently associated with chemicals with a relatively high vapour pressure, so that gradual loss through volatilization could reduce the effectiveness of treatment.

Three tests were made with insecticidal additives in polyurethane. In Test No. 12 (Table 6), a foam based on polyester prepolymer, which was readily attacked in the untreated condition by both *N. exitiosus* and *C. lacteus*, was not protected by any of five chemicals, all known to be effective termite toxicants. It is possible that these chemicals may have been partly, or wholly, inactivated during the processing of the foam. This view was supported by the results of Test No. 13 (Table 6), in which two of the chemicals concerned, aldrin and dieldrin, even when used at 10 times the concentration in Test No. 12, failed to protect the polyester prepolymer foam against attack. Furthermore, in both these tests, the toxicity of treated foams to the termites was no different from that of the untreated foam.

In Test No. 14 (Table 6) not only was a polyurethane elastomer completely protected from termite attack by additions of chlordane or dieldrin which proved completely inadequate in Test No. 12, but the treatments also exhibited a medium to high toxicity to the termites.

The evidence of the above three tests leaves little doubt that the processes involved in producing polyurethane foams effectively inactivate insecticidal additives such as aldrin, dieldrin, and chlordane.

A general review of the results of this series of tests of insecticidal additives shows that the only compounds tested which gave a high level of protection were aldrin and dieldrin, with both lindane and Sevin showing some promise. Furthermore, the first two compounds when incorporated in plastic proved to be highly resistant to an accelerated ageing process. For these reasons, aldrin and dieldrin would appear to be

the most logical insecticides for the termite-proofing of plastics. Further work is still required, however, to determine the most satisfactory methods of incorporating all of these compounds in order to ensure efficient retention, and to overcome the problem of the inactivation of insecticidal additives incorporated in foams.

(e) Incorporation of Inert Fillers

The desirability of termite-proofing plastics by the incorporation of compounds such as aldrin and dieldrin may be open to question because of possible hazards involved. For instance, it is doubtful whether plastic piping incorporating either of these compounds would be acceptable to public health authorities or to customers themselves for use in domestic water supplies. To give another example, the repeated handling of treated cable sheathing by technicians could conceivably result in the absorption of toxic amounts of insecticide through the skin, especially as insecticides tend to bloom out on the surface of some plastics. Although these hazards may very well be negligible, it seems desirable to look for alternative means of producing a satisfactory level of termite resistance in normally susceptible plastics by methods other than the incorporation of insecticides that are toxic to man.

By means of simple scratch tests carried out under a binocular microscope (Bailey 1954), using termite worker mandibles cemented to the tips of dissecting needles, it has been possible to show that all the plastic materials listed in Table I have an intrinsic hardness less than that of termite mandibles. Although scratching occurred most readily on obviously soft and non-rigid plastics and was increasingly difficult on semi-rigid and rigid plastics, there is no a priori reason why any of these materials should not be scored by mandibular action and ultimately attacked to a greater or lesser extent by termites. The test results show, however, that many of these plastics, particularly the rigid types, do not suffer much damage, but semi-rigid and non-rigid plastics are often extensively damaged. It is concluded from this that the intrinsic hardness of a plastic plays some part in its termite resistance.

There appear to be three ways in which this factor of hardness might be used to reduce the amount of termite damage to plastics in service. The first two are the more widespread use of rigid plastics, and the development of surface-hardening techniques. Both these approaches, however, involve a sacrifice of flexibility and limit the field of application of the end product. The third method, which has very little effect on flexibility and would not limit the applications of the end product, is to improve the "internal hardness" of the plastic by incorporating finely divided mineral particles, preferably using minerals intrinsically harder than termite mandibles.

It is common practice to add either organic or inorganic fillers to plastics, and materials such as mica, china clay, diatomaceous earth, and calcium carbonate are often used for such purposes as improving the electrical properties, heat resistance, or moulded appearance of plastics. Accordingly, a series of tests was made to explore the possibilities of this practice with the broad objective of producing a filled plastic so abrasive to termite mandibles as to discourage attack. The results are summarized in Table 7.

In Test No. 1 (Table 7), various mineral powders ground to pass a 200-mesh sieve were incorporated in non-rigid polyvinyl chloride at the rate of 5% by volume.

LABORATORY TESTS OF EFFECT OF ADDING INERT FILLERS ON TERMITE RESISTANCE OF PLASTICS N.e., Nasutifermes exitiosus; C.l., Coptotermes lacteus; C.a., Coptotermis

ż	No. Details of Sample	No. and Type of Samples	Sp.	Amt.	Amt. Eaten (g) (%)	Remarks
	Corvic D65.2 polymer. plasticized with 47.5%, DOP untreased	Polyvinyl Chloride	7	1.03	0.01	A 11 0
	0.0625-in. thick sheet	(exposed edges)	;	76.1	0.01	An o samples badily attacked
	As above - 5% by vol. hard clay	8, Strips	C.1.	3-14	28.2	All 8 samples badly attacked to destroyed
	# T T T T T T T T T T T T T T T T T T T	(exposed edges)				
	As above -5% by vol. barytes	8, Strips	C.I.	0.87	6.7	Six samples slightly attacked, 2 attacked
	As above \$00 hy vol light magnetism carbonate	(exposed edges)	į	8		
		8, Strips	۲.,	3	78.1	Seven samples badly attacked, I attacked
	As above -5% by vol. talc	(exposed edges) 8 Strins	10	1.56	14.2	Corton commelian attendand to Makely account.
		(exposed edges)	;	-	1	seven samples attacked, i sugnity attacked
	As above 5% by vol. Micafine P	8, Strips	C.1.	3.98	33.0	All 8 samples badly attacked
	As above - 5°, by vol. water ground whiting	(exposed edges) 8. Strips	C	1 - 37	12.7	All 8 camples attacked
		(exposed edges)				or samples attached
	As above - 5% by vol. activated whiting	8. Strips	C.I.	1.43	12.8	Six samples attacked, 2 slightly attacked
	Acabore - 60/ her end onto blant.	(exposed edges)				
	As above - 3% by vol. soit black	8, Strips	C.1.	2.08	17.0	Six samples attacked, I badly attacked, I slightly attacked
	As above 5°, hy vol furnace black	(exposed edges)	,		,	
		o, Strips (our posed adam)	۲.,	3.1	1.91	Six samples attacked, 2 badly attacked
	As above - 5°, by vol. channel black	8 Strins	7	3.11	17.1	Three currenter actuals at the discount of
		(exposed edges)		:		tiller samples amached, o badly attached
	As above 5% by vol. acetylene black	8, Strips	C.1.	1 - 68	14.7	All 8 samples attacked
		(exposed edges)				
	As above — 5% by vol. fine-particle silica (Aerosil)	8. Strips	C.Y.	1.54	13.0	Four samples attacked, 4 slightly attacked to attacked
	As above as \$0' hy yell provide along a page 1995	(exposed edges)				
	acord of the powdered glass varia	8, Strips		1.05	10.1	Four samples attacked, 4 slightly attacked to attacked
	As above - 5% hard eilica	(exposed edges)	,		•	
				66.0	۲. ۲	All 8 samples sugnity attacked
	As above \$0' coff ciling	(exposed edges)				
		8, Strips		69.0	7.0	Five samples slightly attacked, 3 slightly attacked to attacked
	As above 5% feldspar	(exposed edges) 8 Strins		0.80	0.3	Electron and and and a state of a
		(exposed edges)	;	200	0	rive samples anached, 3 sugnity anached to attacked
	As above - 5% zircon flour	8, Strips	C.I.	0.61		Seven samples slightly attacked 1 slightly attacked to associate
					l	Terest on the ordered and and the state of the ordered attacks

	As above 5", calcite	Strips		1.03	6.5	Six camples attacked 2 clickely accorded to accorded
						or samples attached, a sugarity attached to attached
	As above ~ 5% diatomaceous earth 8,	. Strips (exposed edges)	C.I.	19.0	5.7	Five samples slightly attacked. 3 slightly attacked to attacked
	As above - 5% South Australian clay 8,		C.1.	2.87	27.7	All 8 samples badly attacked
CI,			N.e.	690-0	1 · 19	Two samples slightly attacked, nibbles on 4
	total mix) 0.0625 in. thick sheet, no additive, density 1.28, B.S.H. at 26°C 8, 85. B.S.S. at 26°C 28	Exposed edges	C.1.	1-023	12.90	Two samples badly attacked, 3 attacked. 3 slightly attacked
	As above - 5% clay by vol., density 1-35, B.S.H. at 26°C 89, B.S.S. at 6,	Exposed edges	N.e.	0.071	1.21	Four samples slightly attacked, nibbles on 2
		, Exposed edges	C.1.	2.045	26.85	Eight samples badly attacked
	- 10% clay by vol., density 1-42, B.S.H. at 26 C 90, B.S.S. at		N.e.	0.100	- 4	One sample attacked, 3 slightly attacked, nibbles on 2
		. Exposed edges	C.I.	2.330	28.15	Eight samples badly attacked
	As above - 20% clay by vol., density 1.57, B.S.H. at 26 C 96, B.S.S. at 6,	Exposed	V.e.	0.230	3.19	Two samples attacked, 4 slightly attacked
			C.I.	2.095	22.30	Seven samples badly attacked, 1 slightly attacked
	As above 40% clay by vol., density 1-85. B.S.H. at 26°C 99. B.S.S. at 6.		N.P.	0.167	1.76	Four samples slightly attacked, nibbles on 2
			C.I.	0.753	12-15	Two samples badly attacked, 3 attacked, 3 slightly attacked
	5 whiting by vol., density 1:35, B.S.H. at 26 C 86, B.S.S. at	Exposed	.V. e.	0.075	1.20	Two samples slightly attacked, nibbles on 4
		Exposed edges	C.7.	688-0	10.60	Three samples badly attacked, 5 attacked
	- 10", whiting by vol., density 1-41. B.S.H. at 26°C 88, B.S.S. at	. Exposed edges	1.6	0.084	1.26	One sample attacked, 2 slightly attacked, nibbles on 3
			C.L.	0.627	7.10	One sample badly attacked, 5 attacked, 2 slightly attacked
	As above - 20% whiting by vol., density 1.55, B.S.H. at 26°C 91, B.S.S. at 6.	 Exposed edges 	N.e.	0.097	1 - 43	Three samples slightly attacked, nibbles on 3
			C.I.	0.788	8.55	Three samples badly attacked, 2 attacked, 3 slightly attacked
	- 40%, whiting by vol., density 1-81, B.S.H. at 26°C 96, B.S.S. at		N.e.	0.208	2.43	Four samples slightly attacked, nibbles on 2
			C.I.	0.737	6.50	One sample badly attacked, 3 attacked, 4 slightly attacked
	- 5% barytes by vol., density 1-44, B.S.H. at 26°C 88, B.S.S. at		N. e.	0.043	0.81	Two samples slightly attacked, nibbles on 4
		. Exposed edges	C.I.	0.444	5.85	Four samples attacked, 4 slightly attacked
	- 10% barytes by vol., density 1.60, B.S.H. at 26°C 90, B.S.S. at		N.º.	0.034	0.54	One sample slightly attacked, nibbles on 4
			C. <u>/</u> .	0.276	3-25	Two samples attacked, 6 slightly attacked
	As above - 20% barytes by vol., density 1.92, B.S.H. at 26 C 92, B.S.S. at 6.		N. 6.	0.023	0.30	Two samples with nibbles, 4 sound
		, Exposed edges	C.T.	0.260	2.45	One sample attacked, 7 slightly attacked
	As above 40% barytes by vol., density 2:58. B.S.H. at 26-C 97, B.S.S. at 6,		N.e.	0.047	0.47	Six samples with nibbles
		Exposed edges	C.I.	0.229	1.80	Seven samples slightly attacked, nibbles on I
	As above - 2.5%, silica by vol., density 1.30, B.S.H. at 26-C 97, B.S.S. at 6.		N.P.	0.025	0.45	Six samples with nibbles
			C.I.	0.350	4.55	Three samples attacked, 5 slightly attacked
	As above = 5% silica by vol., density 1-33. B.S.H. at 26°C 88, B.S.S. at 6,		N.e.	0.035	0.65	Two samples slightly attacked, nibbles on 4
		Exposed edges	C.I.	0.258	3.75	One sample attacked, 7 slightly attacked
	- 10°, silica by vol., density 1.36, B.S.H. at 26°C 88, B.S.S. at	Exposed edges	.v.e.	0.030	0.41	Six samples with nibbles
		Exposed edges	C.I.	0.136	1.40	Three samples slightly attacked, extensive nibbles on 5
	As above + 20% silica by vol., density 1.45. B.S.H. at 26°C 92, B.S.S. at 6,		N.e.	0.023	0.39	Six samples with nibbles
	26 C 19 8,	Exposed edges	C.1.	0.103	1.30	Slight attack on 7 samples, nibbles on 1
	As above 40% silica by vol., density 1.61, B.S.H. at 26°C 97, B.S.S. at 6,	Exposed edges	N.e.	0.015	0.24	Three samples with nibbles, 3 sound
	26°C 10	Exposed edges	C.L	0.057	0.65	Slight attack on 4 samples, nibbles on 4

TABLE 7 (Continued)

Metabol Matter Ca. 0-178 1-391 17-85 17-	8, Exposed edges N.e. 1-391 17-85 8, Exposed edges C.l. 0-507 5-12 8, Exposed edges C.a. 0-717 8-14 8, Exposed edges C.a. 0-18 5-20 8, Exposed edges C.a. 0-18 1-75 8, Exposed edges C.a. 0-131 1-84 8, Exposed edges C.l. 0-145 3-55 8, Exposed edges C.l. 0-449 4-65 8, Exposed edges C.l. 0-447 4-48 8, Exposed edges C.l. 0-430 4-65 8, Exposed edges C.l. 0-131 2-52 8, Exposed edges C.l. 0-131 2-52 8, Exposed edges C.l. 0-131 2-54 8, Exposed edges C.l. 0-130 2-53 8, Exposed edges C.l. 0-131 1-71 8, Exposed edges C.l. 0-143 1-71 8, Exposed edges C.l. 0-145 7-12 <	S es	Details of Sample	No. and Type of Samples	Sp.	Amt. Eaten	(%)	Remarks
8, Exposed edges 8, Exposed ed	8, Exposed edges N.e. 1-391 17-85 8, Exposed edges C.l. 0-507 5-12 8, Exposed edges C.a. 0-618 5-20 8, Exposed edges C.a. 0-145 3-55 8, Exposed edges C.a. 0-145 3-55 8, Exposed edges C.a. 0-131 1-34 8, Exposed edges C.l. 0-445 4-65 8, Exposed edges C.l. 0-430 4-65 8, Exposed edges C.l. 0-341 1-74 8, Exposed edges C.l. 0-30 1-74 8, Exposed edges C.l. 0-131 2-52 8, Exposed edges C.l. 0-131 2-52 8, Exposed edges C.l. 0-130 2-53 8, Exposed edges C.l. 0-130 2-65 8, Exposed edges C.l. 0-130 2-65 8, Exposed edges C.l. 0-143 1-71 8, Exposed edges C.l. 0-145 1-12		Pol	yvinyl Chloride (Cont	inued)			
8, Exposed edges C.L. 0.507 5-12 8, Exposed edges C.a. 0.717 8-14 8, Exposed edges C.a. 0.718 8-14 8, Exposed edges C.a. 0.445 3-55 8, Exposed edges C.a. 0.445 3-55 8, Exposed edges C.a. 0.445 3-55 8, Exposed edges C.a. 0.451 4-48 8, Exposed edges C.a. 0.447 4-48 8, Exposed edges C.a. 0.301 2-52 8, Exposed edges C.a. 0.194 1-66 8, Exposed edges C.a. 0.104 1-66 8, Exposed edges C.a. 0.601 2-03 8, Exposed edges C.a. 0.601 1-15 8, Exposed edges C.a. 1-601 11-15 8, Exposed edges C.a. 1-601 11-15 8, Exposed edges C.a. 1-601 11-15 8, Exposed edges C.a. 1-601 10-50 8, Exposed edges C.a. 1-601 10-50 8, Exposed edges C.a. 1-603 1-65 8, Exposed edges C.a. 0-133 1-64 8, Exposed edges C.a. 0-135 1-04 8, Exposed edges C.a. 0-135 1-04 8, Exposed edges C.a. 0-121 10-50 8, Exposed edges C.a. 0-121 10-50 8, Exposed edges C.a. 0-122 10-40 8, Exposed edges C.a. 0-185 1-55 8, Exposed edges C.a. 0-121 10-50 8, Exposed edges C.a. 0-185 1-55	8, Exposed edges	3	Geon 101 EP resin, D.I.O.P. and T.C.P. plasticizers 44 parts/100 parts	8, Exposed edges	N.e.	1 - 391	17.85	Eight samples attacked
8, Exposed edges	8, Exposed edges		base resin + 47.5% by wt. calcium carbonate (Omya B.S.H.), 0.0625-		C.	0.507	5.12	Four samples attacked, 4 slightly attacked
8, Exposed edges N.e. 0-618 5-20 8, Exposed edges C.a. 0-218 1-75 8, Exposed edges C.a. 0-242 3-55 8, Exposed edges C.a. 0-161 1-28 8, Exposed edges C.a. 0-161 1-28 8, Exposed edges C.a. 0-366 3-78 8, Exposed edges C.a. 0-366 3-78 8, Exposed edges C.a. 0-363 4-20 8, Exposed edges C.a. 0-363 4-20 8, Exposed edges C.a. 0-369 1-54 8, Exposed edges C.a. 0-101 1-54 8, Exposed edges C.a. 0-102 0-94 8, Exposed edges C.a. 0-103 0-93 8, Exposed edges C.a. 0-103 1-0-5 8, Exposed edges C.a. 1-67 10-50 8, Exposed edges C.a. 0-103 1-0-5 8, Exposed edges C.a. 1-67 10-50 9, 1-10-10-10-10-10-10-10-10-10-10-10-10-10	8, Exposed edges N.e. 0-618 5-20 8, Exposed edges C.l. 0-218 1-75 8, Exposed edges C.l. 0-161 1-28 8, Exposed edges C.l. 0-161 1-28 8, Exposed edges C.l. 0-161 1-28 8, Exposed edges C.l. 0-459 4-65 8, Exposed edges C.l. 0-36 3-78 8, Exposed edges C.l. 0-131 0-54 8, Exposed edges C.l. 0-123 0-54 8, Exposed edges C.l. 0-123 0-54 8, Exposed edges C.l. 0-123 0-94 8, Exposed edges C.l. 0-123 0-94 8, Exposed edges C.l. 0-133 0-94 8, Exposed edges C.l. 0-133 0-94 8, Exposed edges C.l. 0-131 0-93 8, Exposed edges C.l. 0-145 1-15 8, Exposed edges C.l. 0-145 1-16 <		in. thick sheet	8, Exposed edges	C.a.	0.717	8 · 14	Two samples badly attacked, 4 attacked, nibbles on 2
8, Exposed edges	8, Exposed edges		As above - 47.5° by wt. crystalline calcium carbonate (Microcalite VK1)	8, Exposed edges	N. C.	0.618	5.20	Three samples attacked, 5 slightly attacked
8, Exposed edges	8, Exposed edges				C.7.	0.218	1 - 75	Two samples attacked, 3 slightly attacked, nibbles on 2
8, Exposed edges	8, Exposed edges			8, Exposed edges	C.a.	0.445	3.55	Two samples attacked, 6 slightly attacked
8. Exposed edges	8. Exposed edges		As above - 47.5°, by wt. ground dolomite (Microdol 1)	8, Exposed edges	1.0.	0.252	2.15	Seven samples slightly attacked, nibbles on 1
8. Exposed edges	8. Exposed edges				C.I.	0.161	1.28	One sample slightly attacked, nibbles on 7
8. Exposed edges	8. Exposed edges 6. C. 0.449 4-65 8. Exposed edges 7. 0.477 4-48 8. Exposed edges 7. 0.543 4-20 8. Exposed edges 7. 0.200 1-54 8. Exposed edges 7. 0.313 2-52 8. Exposed edges 7. 0.133 0-54 8. Exposed edges 7. 0.130 0-24 8. Exposed edges 7. 0.123 0-24 8. Exposed edges 7. 0.124 1-66 8. Exposed edges 7. 0.127 2-65 8. Exposed edges 7. 0.127 1-12 8. Exposed edges 7. 0.127 1-12 8. Exposed edges 7. 0.127 1-12 8. Exposed edges 7. 0.123 1-12 8. Exposed edges 7. 0.123 1-35 8. Exposed edges 7. 0.123 1-35 8. Exposed edges 7. 0.123 1-04 8. Exposed edges 7. 0.185 1-55 8. Exposed edges 7. 0.131 10-40 8. Exposed edges 7. 0.135 1-54				C.a.	0.223	1 · 84	Five samples slightly attacked, nibbles on 3
8, Exposed edges	8, Exposed edges		As above - 47.5°, by wt. coarsely ground dolomite (Microdol 4.200)		1.6	0.459	4 · 65	Two samples attacked, 5 slightly attacked, nibbles on 1
8. Exposed edges	8. Exposed edges				C.I.	0.447	4.48	Five samples attacked, 3 slightly attacked
8. Exposed edges	8. Exposed edges				C.a.	998.0	3.78	Seven samples slightly attacked, nibbles on 1
8, Exposed edges	8, Exposed edges		As above - 47.5% by wt. fine dolomite (Microdol Extra)		1.0	0.543	4.20	Four samples attacked, 4 slightly attacked
8, Exposed edges C.a. 0.331 2.52 8, Exposed edges N.e. 0.309 2.50 8, Exposed edges C.l. 0.129 1.05 8, Exposed edges C.l. 0.170 1.71 8, Exposed edges C.l. 0.770 2.65 8, Exposed edges C.l. 0.178 1.71 8, Exposed edges C.l. 0.178 1.71 8, Exposed edges C.l. 0.945 7.12 8, Exposed edges C.l. 0.945 7.12 8, Exposed edges C.l. 0.945 7.12 8, Exposed edges C.l. 0.13 0.93 8, Exposed edges C.l. 0.13 0.93 8, Exposed edges C.l. 0.13 1.49 8, Exposed edges C.l. 0.13 1.49 8, Exposed edges C.l. 0.135 1.04 8, Exposed edges C.l. 0.250 1.82 8, Exposed edges C.l. 0.20 3.29 8, Exposed edges C.l. 0.20 3.29	8, Exposed edges C.a. 0.331 2.52 8, Exposed edges N.e. 0.309 2.50 8, Exposed edges C.l. 0.104 1.66 8, Exposed edges C.l. 0.107 2.65 8, Exposed edges C.l. 0.178 1.71 8, Exposed edges C.l. 0.178 1.71 8, Exposed edges C.l. 0.10 2.03 8, Exposed edges C.l. 0.945 7.12 8, Exposed edges C.l. 0.945 7.12 8, Exposed edges C.l. 0.945 7.12 8, Exposed edges C.l. 0.13 0.93 8, Exposed edges C.l. 0.13 1.04 8, Exposed edges C.l. 0.13 1.04 8, Exposed edges C.l. 0.13 1.05 8, Exposed edges C.l. 0.13 1.55 8, Exposed edges C.l. 0.13 1.55 8, Exposed edges C.l. 0.13 1.55 8, Exposed edges C.l. 0.135 1.55 8, Exposed edges C.l. 0.135 1.55				C.T.	0.200	1 · 54	Six samples slightly attacked, nibbles on 2
8, Exposed edges	8, Exposed edges				C.a.	0.331	2.52	Seven samples slightly attacked, nibbles on 1
8, Exposed edges	8, Exposed edges		As above - 47.5% by wt. micronized labradorite (Microvit)		1.6.	0.309	$2 \cdot 50$	Eight samples slightly attacked
8, Exposed edges C.a. 0.194 1-66 8, Exposed edges C.a. 0.270 2-65 8, Exposed edges C.a. 0.210 2-03 8, Exposed edges C.a. 0.210 2-03 8, Exposed edges C.a. 0.945 7-12 8, Exposed edges C.a. 1-667 10-55 8, Exposed edges C.a. 1-667 10-55 8, Exposed edges C.a. 0.123 0.93 8, Exposed edges C.a. 0.123 0.93 8, Exposed edges C.a. 0.135 1-04 8, Exposed edges C.a. 0.135 1-04 8, Exposed edges C.a. 0.250 1-82 8, Exposed edges C.a. 0.200 1-82 8, Exposed edges C.a. 1-221 10-40 8, Exposed edges C.a. 1-221 10-40 8, Exposed edges C.a. 1-221 10-30 8, Exposed edges C.a. 1-221 10-30 8, Exposed edges C.a. 1-221 10-30	8, Exposed edges C.a. 0·194 1·66 8, Exposed edges C.a. 0·210 2·65 8, Exposed edges C.a. 0·210 2·03 8, Exposed edges C.a. 0·210 2·03 8, Exposed edges C.a. 0·245 7·12 8, Exposed edges C.a. 1·67 10·55 8, Exposed edges C.a. 0·045 7·12 8, Exposed edges C.a. 0·123 0·93 8, Exposed edges C.a. 0·123 10·94 8, Exposed edges C.a. 0·123 1·04 8, Exposed edges C.a. 0·250 1·82 8, Exposed edges C.a. 1·221 10·40 8, Exposed edges C.a. 1·221 10·40 8, Exposed edges C.a. 1·221 10·40 8, Exposed edges C.a. 0·185 1·55 8, Exposed edges C.a. 0·135 1·55 8, Exposed edges C.a. 0·135 1·55				C.I.	0.123	0.94	Four samples slightly attacked, nibbles on 4
8, Exposed edges	8. Exposed adges N.e. 0.270 2.65 8, Exposed adges C.l. 0.178 1.71 8, Exposed adges C.l. 0.203 1.71 8, Exposed adges C.l. 0.945 7.12 8, Exposed adges C.l. 0.945 7.12 8, Exposed adges C.l. 0.131 0.95 8, Exposed adges C.l. 0.131 0.95 8, Exposed adges C.l. 0.133 1.04 8, Exposed adges C.l. 0.135 1.04 8, Exposed adges C.l. 0.135 1.04 8, Exposed adges C.l. 0.402 3.29				C.a.	0.194	1.66	Six samples slightly attacked, nibbles on 2
8, Exposed edges C.L. 0-178 1-71 8, Exposed edges C.A. 0-210 2-03 8, Exposed edges C.A. 0-945 7-12 8, Exposed edges C.A. 1-620 11-15 8, Exposed edges C.A. 1-667 10-55 8, Exposed edges C.A. 1-667 10-55 8, Exposed edges C.A. 0-123 0-93 8, Exposed edges C.A. 0-123 1-49 8, Exposed edges C.A. 0-135 1-04 8, Exposed edges C.A. 0-121 10-40 8, Exposed edges C.A. 1-221 10-40 8, Exposed edges C.A. 1-221 10-40 8, Exposed edges C.A. 0-185 1-55	8, Exposed edges C.L. 0-178 1-71 8, Exposed edges C.a. 0-210 2-03 8, Exposed edges C.a. 1-620 11-15 8, Exposed edges C.a. 1-667 10-55 8, Exposed edges C.A. 1-667 10-55 8, Exposed edges C.L. 0-945 7-12 8, Exposed edges C.L. 0-123 0-93 8, Exposed edges C.L. 0-123 1-95 8, Exposed edges C.L. 0-135 1-04 8, Exposed edges C.A. 0-121 10-40 8, Exposed edges C.A. 1-221 10-40 8, Exposed edges C.A. 1-221 10-40 8, Exposed edges C.A. 0-135 1-55 8, Exposed edges C.A. 0-135 1-55 8, Exposed edges C.A. 0-135 1-55		As above - 47.5% by wt. coarser labradorite (Aluvit 100)	8, Exposed edges	N. P.	0.270	2.65	Seven samples slightly attacked, extensive nibbles on 1
8, Exposed edges C.a. 0-210 2-03 8, Exposed edges C.l. 0-950 11-15 8, Exposed edges C.l. 0-957 7-12 8, Exposed edges C.l. 1-667 10-55 8, Exposed edges C.l. 0-123 0-93 8, Exposed edges C.l. 0-123 0-93 8, Exposed edges C.l. 0-135 1-04 8, Exposed edges C.l. 0-402 3-29 8, Exposed edges C.l. 1-221 10-40 8, Exposed edges C.l. 1-221 10-40 8, Exposed edges C.l. 0-125 1-0-35	8, Exposed edges C.a. 0-210 2-03 8, Exposed edges C.l. 1-620 11-15 8, Exposed edges C.l. 1-667 10-15 8, Exposed edges C.l. 1-667 10-55 8, Exposed edges C.l. 1-67 10-55 8, Exposed edges C.l. 0-123 0-93 8, Exposed edges C.l. 0-123 1-49 8, Exposed edges C.l. 0-135 1-49 8, Exposed edges C.l. 0-135 1-04 8, Exposed edges C.l. 0-135 1-04 8, Exposed edges C.l. 0-135 1-05 8, Exposed edges C.l. 0-402 3-29 8, Exposed edges C.l. 0-402 3-29 8, Exposed edges C.l. 0-402 3-29 8, Exposed edges C.l. 0-042 0-35			8, Exposed edges	C.I.	0.178	1.71	One sample attacked, 6 slightly attacked, nibbles on 1
8. Exposed edges N.e. 1-620 11-15 8, Exposed edges C.L. 1-647 10-55 8, Exposed edges C.A. 1-647 10-55 8. Exposed edges C.L. 0-123 0-93 8. Exposed edges C.A. 0-123 0-93 8. Exposed edges C.A. 0-135 1-49 8. Exposed edges C.L. 0-135 1-04 8. Exposed edges C.A. 0-135 1-04 8. Exposed edges C.L. 0-135 1-04 8. Exposed edges C.L. 0-135 1-05 8. Exposed edges C.L. 0-402 3-29 8. Exposed edges C.L. 0-402 3-29 8. Exposed edges C.A. 1-221 10-40 8. Exposed edges C.L. 0-135 1-55 8. Exposed edges C.L. 0-145 3-29 8. Exposed edges C.L. 0-142 3-29 8. Exposed edges C.L. 0-142 3-29 9. Exposed edges C.L. 0-142 3-29	8. Exposed edges N.e. 1-620 11-15 8, Exposed edges C.l. 1-647 10-55 8, Exposed edges C.l. 1-647 10-55 8, Exposed edges N.e. 0-431 3-85 8. Exposed edges N.e. 0-123 0-93 8. Exposed edges N.e. 0-195 1-49 8. Exposed edges C.l. 0-135 1-04 8. Exposed edges C.l. 0-135 1-04 8. Exposed edges C.l. 0-135 1-04 8. Exposed edges C.l. 0-130 10-50 8. Exposed edges C.l. 0-402 3-29 8. Exposed edges C.l. 0-402 3-29 8. Exposed edges C.l. 0-402 3-29 8. Exposed edges C.l. 0-042 3-55 8. Exposed edges C.l. 0-042 3-55 8. Exposed edges C.l. 0-042 0-35 8. Exposed edges C.l. 0-042 0-35 8. Exposed edges C.l. 0-042 0-35			8, Exposed edges	C.a.	0.210	2.03	Five samples slightly attacked, nibbles on 3
8. Exposed edges C.L. 0.945 7-12 8, Exposed edges C.A. 1-667 10-55 8. Exposed edges C.A. 0-131 3-85 8. Exposed edges C.L. 0-133 0-93 8. Exposed edges C.L. 0-195 1-49 8. Exposed edges C.L. 0-135 1-04 8. Exposed edges C.A. 0-135 1-04 8. Exposed edges C.A. 0-130 10-50 8. Exposed edges C.L. 0-135 1-04 8. Exposed edges C.L. 0-030 1-82 8. Exposed edges C.L. 0-040 3-29 8. Exposed edges C.L. 1-221 10-40 8. Exposed edges C.L. 0-042 3-29 8. Exposed edges C.L. 0-042 3-29 8. Exposed edges C.L. 0-042 3-39 8. Exposed edges C.L. 0-042 3-39	8. Exposed edges C.L. 0.945 7.12 8, Exposed edges C.a. 1.667 10.55 8. Exposed edges C.a. 0.123 0.93 8. Exposed edges C.a. 0.195 1.49 8. Exposed edges C.a. 0.195 1.49 8. Exposed edges C.l. 0.135 1.04 8. Exposed edges C.l. 0.130 10.9 8. Exposed edges C.l. 0.402 3.29 8. Exposed edges C.l. 0.402 3.29 8. Exposed edges C.l. 0.402 3.29 8. Exposed edges C.l. 0.402 3.59 8. Exposed edges C.l. 0.402 0.35 8. Exposed edges C.l. 0.402 0.35 8. Exposed edges C.l. 0.402 0.35		As above - 47.5% by wt. micronized muscovite mica (Micro-Mica W)	8, Exposed edges	N.e.	1.620	11 - 15	Seven samples attacked, I slightly attacked
8, Exposed edges C.a. 1-667 10-55 8, Exposed edges C.a. 0-431 3-85 8. Exposed edges C.l. 0-131 0-93 8, Exposed edges C.l. 0-135 1-49 8, Exposed edges C.l. 0-135 1-04 8, Exposed edges C.l. 0-402 3-29 8, Exposed edges C.l. 10-40 9, Exposed edges C.l. 10-40 9, Exposed edges C.l. 10-40	8, Exposed edges C.a. 1-667 10-55 8, Exposed edges C.a. 0-431 3-85 8. Exposed edges C.l. 0-131 0-93 8, Exposed edges C.l. 0-135 1-49 8, Exposed edges C.l. 0-135 1-04 8, Exposed edges C.l. 0-402 3-29 8, Exposed edges C.l. 1-221 10-40 8, Exposed edges C.l. 0-185 1-55 8, Exposed edges C.l. 0-042 0-35 8, Exposed edges C.l. 0-042 0-35 8, Exposed edges C.l. 0-042 0-35			8, Exposed edges	C.I.	0.945	7 · 12	Three samples badly attacked, 4 attacked, 1 slightly attacked
8. Exposed edges	8, Exposed edges			8, Exposed edges	C.a.	1.667	10.55	Four samples badly attacked, 4 attacked
8. Exposed edges	8. Exposed edges C.I. 0-123 0-93 8. Exposed edges C.a. 0-195 1-49 8. Exposed edges N.e. 0-485 1-49 8. Exposed edges C.I. 0-135 1-04 8. Exposed edges C.I. 0-135 1-04 8. Exposed edges C.I. 0-402 1-92 8. Exposed edges C.I. 0-402 3-29 8. Exposed edges C.I. 0-402 3-29 8. Exposed edges C.I. 0-402 1-55 8. Exposed edges C.I. 0-042 0-35		As above - 47.5% by wt. tale with magnesite (Microtale AT1)		N.e.	0.431	3.85	Two samples attacked, 6 slightly attacked
8. Exposed edges	8. Exposed edges				C.L	0.123	0.93	Two samples slightly attacked, nibbles on 6
8, Exposed edges N.e. 0-885 3-85 8, Exposed edges C.l. 0-135 1-04 8, Exposed edges C.l. 0-135 1-04 8, Exposed edges C.l. 0-402 3-29 8, Exposed edges C.l. 0-402 3-29 8, Exposed edges C.l. 1-221 10-40 8, Exposed edges C.l. 0-042 0-35 8, Exposed edges C.l. 0-045 0-35 8, Exposed edges C.l. 0-045 0-35 8, Exposed edges C.l. 0-045 0-35	8. Exposed edges				C.a.	0.195	1.49	Five samples slightly attacked, nibbles on 3
8. Exposed edges C.l. 0-135 1-04 8. Exposed edges C.a. 0-250 1-82 8. Exposed edges N.e. 0-310 10-50 8. Exposed edges C.l. 0-402 3-29 8. Exposed edges C.a. 1-221 10-40 8. Exposed edges N.e. 0-185 1-55 8. Exposed edges C.l. 0-042 0-35 8. Exposed edges C.l. 0-042 0-35	8. Exposed edges C.l. 0·135 1·04 8. Exposed edges C.a. 0·250 1·82 8. Exposed edges C.l. 0·310 10·50 8. Exposed edges C.l. 0·402 3·29 8. Exposed edges C.a. 1·221 10·40 8. Exposed edges C.l. 0·185 1·55 8. Exposed edges C.l. 0·042 0·35 8. Exposed edges C.l. 0·135 1·24		As above - 47.5%, by wt. fine tale with magnesite (Microtale ATI Extra)		N.e.	0.485	3.85	Two samples attacked, 6 slightly attacked
8. Exposed edges C.a. 0.250 1.82 8. Exposed edges N.c. 0.310 10.50 8. Exposed edges C.l. 0.402 3.29 8. Exposed edges C.a. 1.221 10.40 8. Exposed edges N.c. 0.185 1.55 8. Exposed edges C.l. 0.042 0.35 8. Exposed edges C.l. 0.042 0.35	8. Exposed edges C.a. 0.250 1.82 8. Exposed edges N.e. 0.310 10.50 8. Exposed edges C.l. 0.402 3.29 8. Exposed edges C.a. 1.221 10.40 8. Exposed edges N.e. 0.185 1.55 8. Exposed edges C.l. 0.042 0.35 8. Exposed edges C.a. 0.135 1.24				C.1.	0.135	1.0	Four samples slightly attacked, nibbles on 4
8. Exposed edges N.c. 0.310 10.50 8, Exposed edges C.l. 0.402 3.29 8. Exposed edges C.a. 1.221 10.40 8, Exposed edges N.c. 0.185 1.55 8. Exposed edges C.l. 0.42 0.35 8. Exposed edges C.l. 0.42 0.35	8. Exposed edges N.c. 0.310 10.50 8, Exposed edges C.l. 0.402 3.29 8, Exposed edges C.a. 1.221 10.40 8, Exposed edges N.c. 0.185 1.55 8, Exposed edges C.l. 0.042 0.35 8, Exposed edges C.l. 0.042 0.35				C.a.	0.250	1 · 82	Seven samples slightly attacked, nibbles on 1
8, Exposed edges C.I. 0.402 3.29 8, Exposed edges C.a. 1.221 10.40 8, Exposed edges N.e. 0.185 1.55 8, Exposed edges C.I. 0.042 0.35 9, Exposed edges C.I. 0.042 0.35	8, Exposed edges C.I. 0.402 3.29 8, Exposed edges C.a. 1.221 10.40 8, Exposed edges N.e. 0.185 1.55 8, Exposed edges C.I. 0.042 0.35 8, Exposed edges C.a. 0.135 1.24		As above - 47.5% by wt. fine tale with magnesite (Microtale IT Extra)		N.C.	0.310	10.50	Seven samples attacked, I slightly attacked
8, Exposed edges C.a. 1-221 10-40 8, Exposed edges N.e. 0-185 1-55 8, Exposed edges C.l. 0-042 0-35 9 Exposed edges C.l. 0-042 0-35	8, Exposed edges C.a. 1·221 10·40 8, Exposed edges N.e. 0·185 1·55 8, Exposed edges C.l. 0·042 0·35 8, Exposed edges C.a. 0·135 1·24				C.1.	0.402	3.29	Two samples badly attacked, 2 attacked, 2 slightly attacked,
8, Exposed edges C.a. 1-221 10-40 8, Exposed edges N.e. 0-185 1-55 8, Exposed edges C.l. 0-042 0-35 9, Exposed edges C.l. 0-042 0-35	8, Exposed edges C.a. 1·221 10·40 8, Exposed edges N.e. 0·185 1·55 8, Exposed edges C.l. 0·042 0·35 8, Exposed edges C.a. 0·135 1·24				ţ		;	nibbles on 2
8, Exposed edges C.I. 0.042 0.35	6, Exposed edges 7.7. 0.163 1.35 8, Exposed edges C.1. 0.042 0.35 8, Exposed edges C.a. 0.135 1.24		As above - 47.5% by ut calcined chies clay (Bobel 40 Clay)		C.a.	1.221	10.40	One sample badly attacked, 6 attacked, 1 slightly attacked
Exposed edges C.f. 0:042 0:33	Exposed edges C.1. 0.042 0.33 Exposed edges C.a. 0.135 1.24		as more at 2 % of will calcined china clay (rolyn) 40 Clay)	o, Exposed edges	e.	0.183	CC	Six samples slightly attacked, extensive nibbles on 2
	C.d. 0'133 1'24			8, Exposed edges		0.042	0.35	Eight samples with nibbles only

	As above - 47.5° by wt. ground whiting	8. Exposed edges	.V.	0.563	4 · 20	Five samples attacked, 3 slightly attacked
		Exposed edges	77	0.314	2.67	One sample attacked 7 slightly attacked
		Tungend added		0.430	2.30	Entry comments according a district according a state of the second and a state of the second an
		Exposed edges	C.a.	666.0	60.0	rive samples attacked, 2 sugntly attacked, niobles on 1
	As above - 47.5% by wt. ground limestone	Exposed edges	1.6.	0.044	2.50	Seven samples attacked, I slightly attacked
		8. Exposed edges	C.I.	0.375	3.00	Four samples attacked, 3 slightly attacked, nibbles on 1
		8. Exposed edges	C.a.	0.445	3.63	Seven samples attacked. I slightly attacked
4	Corvic D65 8 PVC nolymer D O P. plasticized at 30-5 parts: 100 parts	lincanned	4.0	0.053	9	Three samples attacked 5 sound
		Uncapped	7	0-033	0.35	One sample destroyed (core exposed). I slightly attacked
						nibbles on 1
	As above + 5% by vol. fine silica, S3E; density 1.42, B.S.H. at 20°C 90	8. Uncapped	V.e.	0.015	0.15	Areas of nibbles on 4 samples
		Uncapped	C.1.	0.030	0.30	Two samples badly attacked (at ends), 2 slightly attacked,
						nibbles on 4
	As above - 10°, by vol. fine silica, S3E; density 1.42, B.S.H. at 20 C 92	8, Uncapped	N.e.	0.015	0.15	Areas of nibbling on 4 samples
		8, Uncapped	C.I.	0.030	0.30	One sample destroyed (core exposed), 2 slightly attacked,
						nibbles on 3
S	Corvic D65 8 PVC polymer, D.O.Pplasticized at 30-5 parts 100 parts	7, Exposed edges	N.e.	0.214	3.30	One sample attacked, 5 slightly attacked, extensive nibbles
	total mix; density 1.31. B.S.H. at 20 C 88, sheet 0.0625 in. thick					on 1
			C.I.	0.448	5.45	Three samples attacked, 5 slightly attacked
	As above - 5°, by vol. fine silica. S3E: density 1.38, B.S.H. at 20°C 91	8, Exposed edges	N.e.	0.049	0.70	Two samples slightly attacked, nibbles (some extensive) on 6
		8, Exposed edges	C.7.	0.119	1 - 45	Three samples attacked, 5 slightly attacked
	As above - 10% by vol. fine silica. SJE; density 1.43, B.S.H. at 20°C 92	7. Exposed edges	V. P.	0.055	99.0	Seven samples slightly attacked
		8, Exposed edges	C.I.	0.092	9.	One sample attacked, 6 slightly attacked, nibbles on 1
	As above - 5% by vol. medium silica. 400 WQ; density 1.37, B.S.H. at	7, Exposed edges	N.e.	690 · 0	08.0	Nibbles on edges of all 7 samples (some extensive)
	20°C 90	8. Exposed edges	C.I.	0.271	3.20	Four samples slightly attacked, nibbles on 4
	As above - 10% by vol. medium silica, 400 WQ; density 1.42, B.S.H. at	7, Exposed edges	N.c.	0.167	2.35	Nibbles on all 7 samples (extensive on 5)
	20°C 92	8, Exposed edges	C.I.	0.207	2-45	Two samples slightly attacked, nibbles on 6
	As above - 5% by vol. coarse silica. S3BC; density 1.37, B.S.H. at 20°C 89	8, Exposed edges	N.e.	0.172	2.05	One sample attacked, 5 slightly attacked, nibbles on 2
		8, Exposed edges	C.I.	0.346	4.30	Two samples attacked, 6 slightly attacked
	As above - 10% by vol. coarse silica, S3BC; density 1.43, B.S.H. at 20°C 91	8. Exposed edges	N.e.	0.129	1.55	Seven samples slightly attacked, nibbles on 1
		8, Exposed edges	C.1.	0.287	3.60	Eight samples slightly attacked
		Polyethylene				
9	Polythene grade 2. untreated (0.125-indiam. rod)	8, Uncapped ends	N.e.	0.005	0.18	Few nibbles on ends of samples
			C.T.	0.015	0.45	Slight attack on ends of 4 samples, nibbles on 4
	As above + 0·1°, silica		N.e.	0.008	0.30	Nibbies at ends and along samples
			C.I.	0.029	1.05	Nibbles along full length of all samples
	As above + 1% silica		N.e.	0.00	0.24	Nibbles at ends and along samples
			C.	0.047	3	Slight attack on ends of 4 samples, extensive nibbles on all
	Polythene, grade 0.3, untreated (0.156-indiam. rod)		N.e.	0.012	0.43	Slight attack on ends of 4 samples, nibbles on 4
			Ċ.	0.040	4.	Slight attack on ends of 4 samples, extensive nibbles on all
	As above + 0·1°, silica		N.e.	0.019	0.43	Slight attack on ends of 2 samples, nibbles on 6
			.; .;	0.015	0.33	Nibbles on ends of all samples
	As above - 1% silica	8, Uncapped ends	N.e.	0.014	0.43	Slight attack on ends of 4 samples, nibbles on 4
		8. Uncapped ends	5	0.022	0.63	Attack on end of I sample, nibbles on ends of 7

TABLE 7 (Continued)

T _E			H		.		
ż	Details of Sample		No. and Type of Samples	Sp.	Amt.	Amt. Eaten (g) (%)	Remarks
			Polyethylene (Continued)	(pai			
7	DFDL-6015 polyethylene, 0.0625-inthick sheet; density 0.919, melt	0.919, melt	8, Strips	N.e.	0.010	0.15	0-15 Isolated nibbles on edges of all 8 samples
	mock 0.5, with 2.3% carbon black, untreated		(exposed edges)	į		,	3
			o, surps		6.774	3.33	Three samples attacked, 4 slightly attacked, nibbles on 1
			8, Strips	C.a.	0.431	6.63	Three samples attacked. 5 slightly attacked
			(exposed edges)				
			8, Strips	N.e.	•	•	No visible attack
			(masked edges)				
			8, Strips	C.a.	0.133	1.42	One sample attacked, nibbles on 3
	As above = 10/ mless-few cilian (consecuence and and a		(masked edges)	;			
	As above 1. o unitatine sinca (average particle size 2-4 µ)		8, Strips	N.C.	0.010	91.0	Isolated edge nibbles on 7 samples
			(exposed edges)				
			8, Strips	C.1.	0.122	-82	Six samples slightly attacked, nibbles on 2
			(exposed edges)			1	
			8, Strips	C.a.	0.342	2.58	One sample attacked, 7 slightly attacked
			(exposed edges)				
			8. Strips	N.C.	*		No visible attack
			(masked edges)				
			8, Strips	C.a.	0.194	2.15	Three samples slightly attacked, nibbles on 1
			(masked edges)				
	As above - 2.5% ultra-fine silica		8, Strips	N.C.	600.0	0.13	Isolated edge nibbles on 7 samples
			(exposed edges)				
			8, Strips	C.1.	01.0	1.50	Five samples slightly attacked, nibbles on 3
			(exposed edges)				
			8, Strips	C.a.	90:30	4.60	Two samples attacked, 6 slightly attacked
			(exposed edges)				
			8, Strips	N.C.	•	•	No visible attack
			(masked edges)				
			8, Strips	C.a.	0.141	1.50	Two samples slightly attacked
			(masked edges)				
	As above - 5% ultra-fine silica		8, Strips	N.e.	0.005	0.02	Edge nibbles on all 8 samples
			(exposed edges)				
			8, Strips	C.I.	0.158	2.40	Eight samples slightly attacked
			(exposed edges)				
			8, Strips	C.a.	0.322	4.80	One sample attacked, 7 slightly attacked
			(exposed edges)				
			8, Strips	N.C.	•		No visible attack
			(masked edges)				
			8, Strips	C.a.	•	•	No visible attack
			(masked edges)				

Small weight loss recorded but not confirmed by visual appearance of sample.

Although the intrinsic hardness of the dusts varied considerably, the British Standard Hardness of the resultant products was fairly uniform, ranging from 88 to 91.

The samples were exposed to the attack of C. lacteus and statistical analysis of the percentages eaten shows that the termite resistance of polyvinyl chloride is significantly improved by the addition of the following materials, listed in order of decreasing effectiveness: hard silica, zircon flour, diatomaceous earth, barytes, soft silica, feldspar, calcite, powdered glass yarn, water-ground whiting, activated whiting, fine-particle silica, talc. The effects of these fillers were so striking, particularly of the first three which reduced damage 66-80% below the untreated level, that further investigation was warranted (Fig. 5).

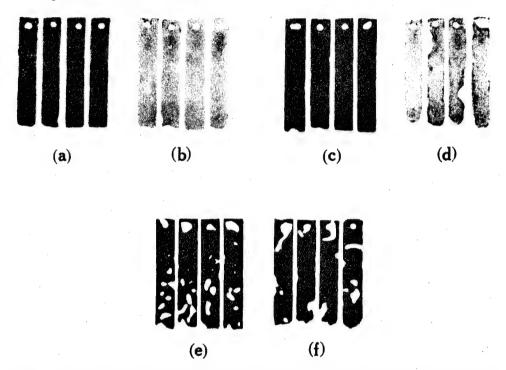


Fig. 5.—Samples of polyvinyl chloride containing various mineral fillers after exposure to attack by *Coptotermes lacteus* in laboratory colonies. (a) Hard silica, 5%; (b) zircon flour, 5%; (c) diatomaceous earth; (d) untreated; (e) Micafine P, 5%; (f) hard clay, 5%.

In Test No. 2 (Table 7), four fillers covering the range from least to most effective in the previous test were re-checked using a different base resin with lower plasticizer level, and the effect of varying the percentage content of filler was also studied. The results confirm that both clay and whiting fillers have little or no value for termite protection and even though improving the hardness might in fact make the end product more susceptible. However, silica and barytes fillers reduce susceptibility quite significantly, and this reduction is positively correlated with the level of addition.

In Test No. 3 (Table 7), a third type of base resin with a moderately high level of mixed plasticizers was used to test a number of different fillers. The level of addition

of fillers was constant at 47.5% by weight and as the specific gravity of the minerals involved ranged from 2.7 to 3.0 this represents a percentage by volume of approximately 16-17.5. Although no untreated control samples were available, the results demonstrate the wide variation in effectiveness of different fillers. The most effective material was calcined china clay and as this result contrasts strongly with those obtained for clay fillers in Tests 1 and 2 it is possible that the improvement is associated with calcining. There is some suggestion from the results with labradorite, dolomite, and talc plus magnesite samples that the particle-size range of fillers influences their performance, but particle-size analyses are needed to confirm this.

In Tests Nos. 4 and 5 (Table 7) the same base resin and plasticizer content were processed into sheet form and cable sheath for further tests of the effects of adding silica filler. Two levels of addition were studied, viz. 5% and 10% by volume, and three grades of silica were used as additives. Details of the particle-size distribution of the silicas are given in Table 8.

TABLE 8
PARTICLE-SIZE DISTRIBUTION OF THREE SILICAS

Particle Size		Silica Additive (% by weight)	
(mm)	S3E	400 WQ	S3BC
< 0.004	5.4	5.2	1 · 3
0.004-0.01	13.8	16.7	1 · 2
0.01 - 0.04	24.2	47 · 1	0.9
> 0 · 04	56.6	31.0	96.6

The untreated sheet material was much more susceptible to attack by both species of termites than was the cable sheath. This is presumably a matter of geometry, in that the sheet material presents many more edges on which the termites can obtain the necessary purchase with their mandibles.

The addition of fine silica to the cable sheath had little effect on its resistance to attack by *C. lacteus*, but both levels of addition reduced the amount of attack by *N. exitiosus* by about two-thirds. All grades of silica brought about a marked improvement in the termite resistance of the sheet material to both species of termites but there was no constant relationship between increased resistance and increased level of filler. The fine silica (Grade S3E) was superior to the two other grades in reducing attack but this cannot be explained logically on the basis of particle-size distribution.

In view of the promising results obtained with silica fillers in polyvinyl chloride, and as this mineral appeared to be among the cheapest and most readily available, two tests were made with silica as a filler in polyethylene. In the first of these (Test No. 6, Table 7), silica was added at two levels to polyethylenes of different melt flow index extruded in rod form. There was no regular pattern in the results but it is evident that no worth-while improvement in termite resistance was achieved.

In the second test (No. 7, Table 7), in which low-density polyethylene was processed in sheet form with three different levels of ultra-fine silica, even the highest level of addition (5% by volume) resulted in only a slight improvement in termite resistance.

This series of tests on fillers shows that (i) certain minerals such as silica, zircon flour, barytes, and calcined china clay can materially improve the termite resistance of plasticized polyvinyl chloride, (ii) with silica and barytes at least, the level of resistance rises as the filler content is increased from 5 to 40% by volume, (iii) there is some evidence that fineness of particle size increases the efficiency of a particular filler, and (iv) the use of silica as a filler for polyethylene does not produce a comparable reduction in termite susceptibility to that achieved in polyvinyl chloride. The ineffectiveness of mineral fillers such as silica in polyethylene, coupled with the fact that all developmental laboratories concerned in the preparation of silica-filled samples of polyvinyl chloride or polyethylene have commented on the greatly accelerated rate of wear on extrusion dies, makes it unlikely that this method of improving the termite resistance of plastics could become commercially practicable.

IV. GENERAL CONCLUSION AND DISCUSSION

The following conclusions may be drawn from the various series of tests that have been described.

Plastics vary considerably in their susceptibility to termite damage but very few of the materials in common use are wholly minune to attack, and some, such as plasticized polyvinyl chloride, low-density polyethylene, polystyrene and polyurethane foams, and cellulose esters, are liable to severe damage. The consistent pattern of minimal attack, comprising a few nibbles along the edges or ends of samples, shown by all grades of nylon emphasizes the potential usefulness of this plastic in situations of high termite hazard.

The liability of a plastic to attack depends upon the species of termite involved and, in general, is lower for *N. exitiosus* than for species of *Coptotermes*, especially *C. acinaciformis*, which is the most widespread and economically important species of termite in Australia. In addition, the physical shape in which a particular plastic is presented to termites influences the severity of attack. This is borne out by the consistently higher levels of attack on samples with exposed ends or edges over those in which only flat or curved surfaces were accessible to the termites, and by the greater liability of termites to penetrate folded rather than flat plastic film.

The termite resistance of plastics, which is influenced by both physical and chemical factors, can be significantly improved by the manipulation of these factors. For example, changes in the nature and amount of plasticizer can materially improve the termite resistance of plasticized polyvinyl chloride, and a similar improvement has been effected in polyethylene through a change from low-density to high-density material, by increasing the molecular weight and lowering the melt flow index.

Thickness is an important factor in determining the termite susceptibility of plastic films or foils, but hardness appears to be more important in products such as piping and cable sheathing. The need for flexibility in cable sheathings and films, however, limits the extent to which hardness can be used to minimize termite damage and has directed attention to the possibility of termite-proofing plastics by incorporating insecticides during the manufacturing process.

Several different insecticides have been added to plastics on an experimental basis, and the most consistently successful results have been obtained with aldrin and

dieldrin. There are, however, certain aspects of the toxic hazard associated with the widespread use of plastics containing these materials which must be kept in mind if commercial production is contemplated. These include the end use of the product and the possibility of cumulative toxic effects on operatives engaged in the production or installation of insecticide-treated plastics.

The usefulness of selected non-toxic mineral fillers, which in small quantities can significantly reduce the termite susceptibility of some plastics without adversely affecting their physical properties, appears to be limited because of processing difficulties.

Finally, there are two broad aspects of the investigation which need to be placed in proper perspective.

The first is the question of the relevance of laboratory test results to performance in service, and whether field exposure tests would be more appropriate despite the considerable length of time which they require. The authors believe that the level of intensity of the termite hazard in the standard laboratory colonies, where the absence of a normal food source places the insect under severe food stress, is seldom, if ever, reached under natural conditions. Accordingly, any material that proves highly or completely resistant in these tests can rearrably be expected to perform similarly in service. On the other hand, field tests introduce the possibility of deterioration by other biological and/or physical factors and, for this reason, may give a better indication of the length of service life. However, the chemical stability of most plastics greatly reduces the significance of these factors, except possibly for some plasticized products or those containing insecticides, and even these can be catered for in laboratory tests by using artificial ageing or weathering techniques (Tests 6A and 6B in Table 6).

The second point is the extent to which these test results are applicable in Australia. It is evident from the consistently more severe attack by *C. acinaciformis*, as compared with *N. exitiosus*, that results obtained with the former species are valid for the whole of temperate Australia. The results of a limited number of tests with *M. darwiniensis* on eight different plastics were essentially the same as those obtained with *C. acinaciformis*. This similarity suggests that the possibility of significant differences in performance of a particular plastic exposed to these two species is slight, and that results obtained in tests with *C. acinaciformis* will also be applicable in tropical Australia.

V. ACKNOWLEDGMENTS

Our thanks are due to the following for the supply of the various plastic samples used in the tests: Dr. J. S. Fitzgerald, formerly of the Chemical Research Laboratories, CSIRO; Cable Makers Australia Pty. Ltd., Liverpool, N.S.W.; Moulded Products (Australasia) Pty. Ltd., Melbourne; Olympic Cables Pty. Ltd., Melbourne; A.P.I. Cables and Insulation Pty. Ltd., Melbourne; I.C.I.A.N.Z. (Plastics Division), Melbourne; Shell Chemical (Australia) Pty. Ltd., Melbourne; Die Casters Ltd., Melbourne; Parfrey Plastics Pty. Ltd., Melbourne; Polymer Corporation Pty. Ltd., Homebush, N.S.W.; Minnesota Mining and Manufacturing (Australasia) Pty. Ltd., St. Marys, N.S.W.; Brown and Dureau Ltd., Melbourne; Henry H. York and Co. Pty. Ltd., Nunawading, Victoria; Westminster Chemical Co. Pty. Ltd., Melbourne;

Union Carbide Australia Ltd., Sydney; Reichhold Chemical Inc. (Australia) Pty. Ltd., Botany, N.S.W.; Astor Plasteel Window Pty. Ltd., Surry Hills, N.S.W.; A.C.I. Plastics (Extrusions Division), Cheltenham, Vic.; Storey, Davies (Sales) Pty. Ltd., Bentleigh, Vic.; Bayer Leverkusen Ltd., Armadale, Vic.; P.M.G. Research Laboratories, Melbourne; Department of Civil Aviation, Melbourne.

We are indebted to Mr. G. A. McIntyre and Dr. E. J. Williams,* Division of Mathematical Statistics, CSIRO, for the statistical analyses of certain of the experimental data; to Mr. J. M. Wright, of Cable Makers Australia Pty. Ltd., and to Mr. W. A. Kelly, of Union Carbide Australia, Ltd., for much valuable technical advice on plastics; and to our reliable and enthusiastic assistants Messrs. V. Williamson, R. A. Barrett, and the late C. Mayo for their part in the conduct of all the experiments.

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 - * Now Professor of Statistics, University of Melbourne.